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# THE
# FORTIETH ANNUAL REPORT
OF THE
# BOARD OF DIRECTORS
OF THE
# ZOOLOGICAL SOCIETY
# OF PHILADELPHIA.

MUS. COMP. ZOOLOGY
CAMBRIDGE, MASS.

(INCORPORATED MARCH 21ST, 1859.)

READ AT THE ANNUAL MEETING OF THE MEMBERS AND LOAN-HOLDERS OF THE SOCIETY.

APRIL 25th, 1912.

PHILADELPHIA:
PRESS OF ALLEN, LANE & SCOTT,
1211-1213 Clover Street.
1912.

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# THE
# ZOOLOGICAL SOCIETY OF PHILADELPHIA.

(FAIRMOUNT PARK.)

## BOARD OF DIRECTORS:

### ELECTED BY THE SOCIETY.

CHARLES B. PENROSE, M. D.,
*President.*

CHARLES M. LEA,
SAMUEL G. DIXON, M. D.,
*Vice-President.*

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*Vice-President.*

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CHARLES S. W. PACKARD,
*Treasurer.*

GEORGE L. HARRISON, JR.,
ALFRED GRATZ.

### ELECTED BY THE CITY COUNCILS.

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JOHN P. CONNELLY.

## SUPERINTENDENT OF THE GARDENS.

ROBERT D. CARSON.

## PATHOLOGIST.

HERBERT FOX, M. D.

## SOLICITOR.

W. W. MONTGOMERY.

# REPORT

### OF THE

# BOARD OF DIRECTORS.

PHILADELPHIA, April 25th, 1912.

The Board of Directors of the Zoological Society of Philadelphia presents to the members and loanholders its fortieth annual report, for the year ending February 29th, 1912.

## GENERAL AFFAIRS AND FINANCES.

The number of members at the close of the year was:—

| | |
|---|---|
| Annual members | 171 |
| Life members | 1,285 |
| Corresponding members | 6 |
| Honorary members | 14 |
| Perpetual members | 248 |
| Junior members | 38 |
| Total members | 1,762 |

The following is a report in detail of the admissions and receipts for the year:—

| | |
|---|---|
| Adults (paying at gates) | 120,080 |
| Children (paying at gates) | 36,675 |
| Members (including life and annual members, loanholders' annual, and complimentary annual tickets) | 1,110 |
| Loanholders' single tickets | 3,390 |
| Free admissions (charitable institutions, donors' tickets, &c.)* | 4,385 |
| Coupon tickets | 107 |
| Excursion tickets | 3,003 |
| | 168,750 |

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* In addition to these, 175,000 tickets were issued to the Board of Education, for the admission of pupils of the Public Schools.

*Monthly Record of Receipts from Admissions for 1911–1912 with corresponding account for 1910–1911.*

| MONTH | 1910–1911 | 1911–1912 | COMPARISON | |
|---|---|---|---|---|
| March...... | $1,135 55 | $1,186 65 | Increase.... | $51 10 |
| April....... | 1,559 05 | 1,937 95 | " .... | 378 90 |
| May....... | 3,282 95 | 3,174 30 | Decrease.... | 108 65 |
| June....... | 2,187 90 | 2,962 40 | Increase.... | 774 50 |
| July....... | 2,833 25 | 3,413 45 | " .... | 580 20 |
| August..... | 4,067 15 | 3,769 15 | Decrease.... | 298 00 |
| September.. | 3,467 20 | 3,518 95 | Increase.... | 51 75 |
| October.... | 2,885 15 | 2,101 45 | Decrease.... | 783 70 |
| November.. | 1,300 10 | 1,388 85 | Increase.... | 88 75 |
| December.. | 616 85 | 1,092 25 | " .... | 475 40 |
| January.... | 653 90 | 515 50 | Decrease.... | 138 40 |
| February... | 1,116 85 | 931 70 | " .... | 185 15 |
| | $25,105 90 | $25,992 60 | Increase..... | $886 70 |

## THE GARDENS.

The total number of animals exhibited in each class during the year was:—

| | |
|---|---|
| Mammals.................................... | 516 |
| Birds.......................................... | 997 |
| Reptiles...................................... | 772 |
| Amphibians................................. | 42 |
| | 2,327 |

The following species were exhibited in the collection for the first time:—

Water Mongoose, *Herpestes brachyurus*, Gray.

Hab. Malay Peninsula, Sumatra and Borneo.

A male of this species, one of the rarest of its genus in captivity, was purchased on March 16th. It curiously resembles the common raccoon in the habit of soaking its food in water before it is eaten; as this species appears to frequent swampy localities, which is also indicated by its name, this would seem to be an effort to reproduce in captivity the conditions under which its food is captured and eaten in a state of freedom.

Cape Hyrax, *Hyrax capensis* (Pallas).

Hab. South Africa.

This animal, purchased on February 17th, is the first specimen belonging to the Sub-Order Hyracoidea that we have exhibited, it closely resembles the animal mentioned in the Bible as the Coney.

Congo Harnessed Antelope, *Tragelaphus gratus*, Sclater.

Hab. The Congo and Gaboon Regions of Central Africa.

A young male, born in the National Zoological Park, Washington, D. C., was purchased on December 7th.

Eld's Deer, *Cervus eldi*, (M'Clelland).

Hab. Burmah and Siam.

A rare species, but one not suited to outdoor existence in this locality in winter. A young pair of these animals which had been bred by the New York Zoological Society was received from that source by presentation on May 4th.

Mexican Deer, *Mazama mexicana* (Gm.).

Hab. South Mexico.

A young male brought from Michoacan, Mexico, by Major C. E. Gillette of Philadelphia and presented by him on November 22d.

Northern Wart Hog, *Macrocephalus africanus* (Gm.).

Hab. Central Africa.

A pair obtained by purchase, in April and June, are the first owned by the Society.

Regal Whydah Bird, *Tetrœnura regia* (L.).

Hab. South Africa.

Quail Finch, *Ortygospiza polyzona* (Temm.).

Hab. Central and Southeastern Africa.

West African Cutthroat Finch, *Amadina marginalis,* Sharpe.

Hab. West Africa.

Blue-bellied Finch, *Estrilda angolensis* (L.).

Hab. Southeast Africa.

A pair of each of these four rare species was obtained on May 26th.

Angola Finch, *Serinus angolensis* (Gm.).
Hab. South Africa.

Yellow-bellied Bunting, *Emberiza flaviventris* (Bonn. & Vieill.).
Hab. Africa.

Short-toed Lark *Calandrella brachydactyla* (Leisl.).
Hab. S. Europe to N. E. Africa into N. W. India.

Smith's Bullfinch Lark, *Pyrrhulauda leucotis smithii* (Bp.).
Hab. South Africa.

Greenish White-eye, *Zosterops virens*, Bp.
Hab. Southeast Africa.

One short-toed lark and two each of the others of these five species were received on December 9th.

Fieldfare, *Turdus pilaris*, L.
Hab. Europe, Asia and North Africa.

Red-winged Thrush, *Turdus iliacus*, L.
Hab. Europe.

One each of these two thrushes was purchased on February 1st.

Rock Thrush, *Monticola saxatilus* (L.).
Hab. Europe, Asia and Africa.
Received September 9th.

Yellow-vented Bulbul, *Pycnonotus layardi*, Gurney.
Hab. South Africa.
Received February 1st.

Transvaal Barbet, *Trachyphonus cafer* (Vieill.).
Hab. Eastern South Africa.
Received by purchase September 21st.

Blue-bellied Lorikeet, *Trichoglossus rubritorquis*, Vig. & Hors.
Hab. Northwest Australia.
A pair of rare birds purchased on July 26th.

Black Grouse, *Tetrao tetrix*, L.
Hab. Europe and Asia.

Two males purchased June 27th; this species, like the *Capercaillie* of the same genus, does not appear to thrive in this locality, this is probably due to the difficulty of supplying them with suitable food.

Natal Francolin, *Francolinus natalensis*, Smith.
Hab. South Africa.
Two purchased November 28th.

Temminck's Monaul, *Lophophorus refulgens*, Temm.
Hab. Himalayan Mountains.
A male purchased February 16th; this is one of the handsomest of the *Phasianidæ* and is generally called, although improperly, the Impeyan Pheasant.

Peacock Pheasant, *Polyplectron chinquis* (Müll.).
Hab. India and Burmah.
A male, the first representative of this genus that we have had, was also purchased on February 16th. The generally sober coloration is relieved by brilliant green and purple ocelli resembling the socalled eyes in the plumage of the peacock.

Mitred Guinea-fowl, *Numida mitrata*, Pallas.
Hab. East Africa, Madagascar and Rodrigues.
A pair received by purchase on March 18th.

Indian Tantalus, *Pseudotantalus leucocephalus* (Forst.).
Hab. India.
Two received May 5th.

Fulvous Tree Duck, *Dendrocygna fulva* (Gm.).
Hab. South Africa and Asia and America south of the United States.

Chiloe Widgeon, *Mareca sibilatrix* (Poeppig).
Hab. Southern South America.
Two pairs of the former and one of the latter were purchased on June 4th.

Caspian Terrapin, *Clemmys Caspica* (Gm.).
Hab. Southern border of the Caspian Sea to the Persian Gulf.

Clifford's Snake, *Coluber diadema* (Schlegel).
Hab. N. Africa, S. Asia and N. W. India.
Received November 24th.

Hissing Sand Snake, *Psammophis sibilans*, L.
Hab. North Africa.
Several specimens received in November and December.

Cope's Tree Frog, *Hyla gabbii*, Cope.
Hab. Costa Rica.
A specimen found in a bunch of bananas and presented on July 26th.

Surinam Toad, *Pipa americana* (L.).

Hab. Guineas and Brazil.

Three individuals presented by the New York Zoological Society on April 13th; an appreciated acquisition of a long desired species well known for its remarkable and highly specialized breeding habits.

The donations of previously exhibited species include: Four grizzly bears—a half grown male, and an adult female with two cubs—obtained through the Department of the Interior and trapped for the Society in the Yellowstone National Park by Colonel L. M. Brett, the Superintendent of the Park. Two agoutis and an Orinoco goose from Mr. Francis E. Bond, Gwynedd Valley, Pa., who obtained them in northern Venezuela. Four blue geese, five little white herons, two little blue herons and seven Louisiana herons from Mr. E. A. McIlhenny, Avery Island, La., and a gray wolf from Mr. William S. Febiger of Philadelphia.

The following were the most important accessions by purchase of specimens not new to the collection: An exceptionally large wombat received in March; a pair of adult red kangaroos and two blackish elephant tortoises, one of the "giant" species from the Galopagos Islands, in April. On June 4th a nearly adult female giraffe arrived at the Garden, this was one of a pair specially captured for the Society in South Africa, but the male, most unfortunately, died during the voyage to this country. In February a pair of Tasmanian devils and a wolverine, the latter from Siberia, were received. During this month there were also obtained four American bison—a young bull and heifer from Iowa and two adult cows from Kansas—these, with the ones previously on hand, representing four distinct lines of descent, should insure to the Society the continuance of this species for many years to come.

The births during the year were as follows:—

1 monkey, ♂, hybrid between *Cercopithecus pygerythrus* ♂ and *C. sabæus*, ♀, August 14th.

3 pig-tailed macaques, (*Macacus nemestrinus*), ♂, March 5th, ♂, October 25th, ♂, December 27th.

1 rhesus macaque (*M. rhesus*), ♀, March 28th.
1 lemur, hybrid between *Lemur mongoz* ♂ and *L. macaco* ♀, May 22d.
4 prairie wolves, (*Canis latrans*), 2 ♂ and 2 ♀, April 10th.
2 gray foxes, (*C. cinereo-argenteus*), ♂ and ♀, April 8th.
5 raccoons, (*Procyon lotor*), one March 27th, two April 4th and two June 14th,
2 white-nosed coatis, (*Nasua narica*), ♀ ♀, June 6th.
1 California hair seal, (*Zalophus californianus*), ♀, June 8th.
6 prairie dogs, (*Cynomys ludovicianus*), four May 12th and two May 23d.
1 isabelline gazelle, (*Gazella isabella*), ♀, April 7th.
4 Indian antelopes, (*Antilope cervicapra*), ♂, March 1st, ♂, May 9th, ♀, July 23d, ♂, October 24th.
1 Himalayan thar, (*Hemitragus jemlaicus*), ♀, May 31st.
3 aoudads, (*Ovis tragelaphus*), ♂ ♂, May 15th, ♂, September 30th.
1 red deer, (*Cervus elaphus*), ♀, September 10th.
1 American elk, (*C. canadensis*), ♀, October 1st.
4 Japanese deer, (*C. sika*), ♂, June 14th, ♀, 18th, ♀, 23d and ♂, 25th.
1 Eld's deer, (*C. eldi*), ♂, January 26th.
2 white-tail deer, (*Mazama virginiana*), ♂ and ♀, May 28th.
1 llama, (*Lama glama*), ♀, December 4th.
2 silver pheasant, (*Gennæus nycthemerus*), May 28th.
5 Swinhoe's pheasants, (*G. swinhoii*), May 11th.
16 golden pheasants, (*Chrysolophus pictus*), May 18th and 28th.
4 Amherst's pheasants, (*C. amherstiæ*), May 30th.
2 gulls, hybrids between *Larus argentatus smithsonianus* and *L. fuscus*, June 4th.
4 Canada geese, (*Branta canadensis*), May 5th.
6 black ducks, (*Anas obscura*), May 14th.
2 summer ducks, (*Aix sponsa*), May 27th.
17 garter snakes, (*Thamnophis sirtalis sirtalis*), August 8th.
9 Sacken's garter snakes, (*T. sackeni*), August 23d.
7 copperheads, (*Ancistrodon contortrix*), September 11th.
5 ground rattlesnakes, (*Sistrurus miliarius*), September 25th.

While the amount expended during the year for animals was greater than usual, the increase was more than offset by the sale of duplicate specimens, most of which were bred in the Garden.

The cost and difficulty of obtaining representative living animals is becoming greater every year. This is due not only to the general tendency towards higher prices and to depleted sources of supply, but to legislation, both here and abroad, for the protection and conservation of wild life, and to the stringent regulations of our Government to prevent the introduction of disease by imported animals.

By curtailing the running expenses of the Garden in its executive department and the strictest economy in other directions the Society was enabled to make a number of permanent improvements and to repair and improve some of the older buildings.

A cage for the Alaska Bears was constructed with elevated rockwork at the back, well suited for the display of these magnificent animals.

The Monkey House was greatly improved by the addition of a skylight, over the back of the cages, and diffusing and ventilating sash. It is now one of the best lighted and ventilated buildings in the Garden. A useful addition to the cage equipment of this building was made by the construction of six cages for small and delicate species.

Part of the carriage shed which, since the advent of the automobile, has served no useful purpose, was changed into a much-needed storage house.

The old music pavilion was altered into an outdoor cage for monkeys and has proved to be admirably suited for the purpose.

With the object of displaying the American porcupine to better advantage than is possible in an ordinary cage, a large crabapple tree was cut down and erected in a desirable location and surrounded by a fence with an overhang to prevent escape. The exhibition of porcupines in this cage has been so successful that other native animals will be shown in a similar manner.

All of the snake cases and tables in the west wing of the

Reptile House were renewed. The cages in the Parrot House, eighty-two in number, were reconstructed. A new fence was erected around the Otter Pond, the old one having been destroyed by a heavy storm during the summer.

Much more painting and general repairs were done than is usual in any one year.

Encouraged by our previous experience, the number of monkeys kept in outdoor cages without artificial heat during the year was increased to fifteen; these were, two hamadryas baboons, four Japanese macaques, eight rhesus macaques and one pigtailed macaque. Although the winter, particularly in January and February, was remarkable for its low temperatures and extended periods of unusual cold, not one of these animals experienced a day's illness and, with the return of warmer weather, they were in better condition, both in appearance and health, than many of those which have had the apparent advantage of a heated building.

The lioness and her cagemate, the Siberian tiger, which last year were kept in an unheated cage with access at all times to the open air, passed through the second winter under similar conditions without showing any discomfort and in perfect health.

The winter of 1911 and 1912 was exceptionally severe. The lowest temperature at the Garden was on the night of January 13th, when five degrees below zero, Fahrenheit, was registered. During the three months there were sixty-three days of freezing weather and, from the first of January to the seventeenth of February there was but one day, according to the official records of the Weather Bureau for this locality, when the temperature did not fall below the freezing point.

The receipts from admissions show a considerable gain over the preceding year, notwithstanding the unfavorable winter and an unusual number of rainy Sundays during the months when we look for the greatest receipts.

WILLIAMS B. CADWALADER,
*Secretary.*

## INCOME AND EXPENDITURES.

For fiscal year ending February 29th, 1912.

### INCOME.

| | | |
|---|---|---|
| Membership dues | $730 00 | |
| Admission receipts | 25,992 60 | |
| Rents at Garden | 250 00 | |
| Interest | 2,365 65 | |
| Sale of animals | 2,005 00 | |
| Sale of guides | 216 15 | |
| Goat and donkey rides | 983 90 | |
| Sundry receipts | 1,457 63 | |
| Advance from fiscal agent | 2,500 00 | |
| Received from the City of Philadelphia through the Commissioners of Fairmount Park | 30,000 00 | |
| | | $66,500 93 |

### EXPENDITURES.

| | | | |
|---|---|---|---|
| Salaries and wages | $22,585 26 | | |
| Office expenses | 562 10 | | |
| General expenses | 30,980 79 | | |
| Purchase of animals | 7,319 59 | | |
| Permanent improvement | 6,128 91 | | |
| | | $67,576 65 | |
| Balance to debit of profit and loss | | 1,075 72 | |
| | | | $66,500 93 |

C. S. W. PACKARD,
*Treasurer.*

Audited and found correct, March 15th, 1912.
Stockton Bates & Sons.

## LIST OF ADDITIONS TO THE MENAGERIE DURING THE YEAR ENDING FEBRUARY 29TH, 1912.

1911.

March 1. 1 Indian antelope (♂) born in the Garden.
" 5. 1 pig-tailed macaque, born in the Garden.
" 7. 1 starling presented by Isaac C. Low, Thoroughfare, N. J.
" 12. 1 California hair seal purchased.
" 13. 1 woodchuck presented by H. L. Westcott, Philadelphia.
" 15. 2 aoudads (♂♂) born in the Garden.
" 16. 1 gray lagothrix (♂), 1 water mongoose (♂), 6 pairs of ungulated grass parrakeets, 6 pairs of crested ground parrakeets, 2 yellow-bellied liothrix, 2 maja finches, 2 Madagascar weavers, 1 bullfinch, 2 red-crested cardinals, 2 European robins, 2 yellow-ammers, 1 pair Japanese nuns, 1 pair ultramarine weavers, 1 pair hooded finches, 1 pair spotted munias, 1 pair crimson-eared waxbills, 2 goldfinches, 1 pair Senegal fire finches and 2 long-necked terrapins purchased. 1 alligator presented by Mrs. Berry Hart, Philadelphia.
" 18. 2 mandrills (♂ and ♀), 1 Rhesus macaque (♂) and 2 mitred guinea-fowl purchased. 1 raccoon (♂) presented by Master Gordon Weld Strawbridge, Germantown, Philadelphia.
" 24. 8 black snakes, 2 chicken snakes, 1 corn snake, 2 keeled green snakes, 10 hog-nosed snakes, 2 king snakes, 1 scarlet snake, 1 banded water snake, 4 whip snakes and 1 yellow-lipped snake purchased.
" 25. 1 leopard tortoise purchased 1 courlan presented by David S. Kindell, s. s. "Algiers."
" 27. 1 raccoon born in the Garden.
" 28. 1 common wombat (♀), 1 vervet monkey (♂), 1 king vulture (♀), 2 long-tailed grass finches, 2 red-headed finches, 2 masked grass finches and 2 Bicheno's finches purchased 1 alligator presented by F. M. Brooks, Philadelphia.
" 29. 1 radiated tortoise, 4 Western diamond rattlesnakes, 6 spiny lizards and 6 common horned lizards purchased.
April 1. 2 California hair seals purchased. 2 DeKay's snakes presented by Dr. Henry Tucker, Philadelphia.
" 3. 4 common garter snakes, 2 indigo snakes, 2 king snakes, 1 banded water snake, 4 whip snakes, 6 fence lizards, 6 green lizards, 1 six-lined lizard and 6 wave-lined lizards purchased.
" 4. 1 white-tailed deer (♂) purchased. 2 raccoons born in the Garden.
" 5. 2 Patagonian conures and 1 blue mockingbird purchased.
" 6. 1 isabelline gazelle (♀) born in the Garden.
" 7. 2 red kangaroos (♂ and ♀) purchased. 2 gray foxes (♂ and ♀) born in the Garden. 1 king rail presented by George Harrison, Philadelphia.
" 9. 2 alligators presented by Andrew Henning, Philadelphia.
" 10. 4 prairie wolves born in the Garden.
" 11. 1 Northern wart hog (♂), 3 mandarin ducks and 2 Japanese teal purchased.
" 13. 3 Surinam toads presented by the New York Zoological Society.
" 14. 1 alligator presented by Mrs. T. J. Fleming, Philadelphia.
" 16. 1 California hair seal purchased.
" 17. 1 American beaver (♀) purchased.

April 19. 1 Siberian fox (♀) presented by Carl Hagenbeck, Hamburg, Germany. 2 Venezuela agoutis and 1 Orinoco goose presented by Frank E. Bond, Philadelphia. 2 blackish elephant tortoises purchased.

" 20. 2 red-shouldered parrakeets purchased.

" 22. 1 common coot presented by Mrs. A. A. Thomas, Philadelphia.

" 23. 1 Egyptian goose hatched in the Garden. 1 alligator presented by Miss Elizabeth Conover, Philadelphia.

" 24. 2 pinche monkeys presented by Frank E. Bond, Philadelphia. 1 black snake presented by S. Scoville, Jr., Philadelphia.

" 26. 2 red kangaroos (♀) with young one in pouch exchanged.

" 27. 1 red-fronted amazon presented by W. C. Hobson, Philadelphia.

May 1. 3 harlequin snakes, 2 water moccasins, 1 ground rattlesnake, 7 black snakes, 1 chicken snake, 1 common garter snake, 2 king snakes, 5 hog-nosed snakes and 3 pine snakes purchased.

" 4. 2 Eld's deer (♂ and ♀) presented by the New York Zoological Society. 1 roseate cockatoo presented by Mrs. Thomas Harvey Dougherty, Germantown, Philadelphia. 1 bald eagle presented by Samuel Rogove, Philadelphia.

" 5. 1 adjutant, 2 Indian tantalus and 1 raquet-tailed drongo purchased. 4 Canada geese born in the Garden. 3 alligators presented by T. H. Dougherty, Jr., Philadelphia.

" 6. 1 gray squirrel presented by G. H. Didinger, Philadelphia.

" 8. 3 young owls presented by G. C. Miller, Philadelphia. 20 gray squirrels purchased.

" 9. 1 Indian antelope born in the Garden. 1 blue and yellow macaw, 2 keeled green snakes, 1 ribbon snake, 5 water snakes and 1 Gila monster purchased.

" 11. 5 Swinhoe's pheasants born in the Garden. 1 gray parrot presented by Mrs. Catherine Harris, Philadelphia.

" 12. 4 blue geese presented by E. A. McIlhenny, Avery Island, La. 4 prairie dogs born in the Garden.

" 13. 1 opossum presented by Master Ralph Fritts, Philadelphia.

" 14. 6 black ducks born in the Garden.

" 16. 1 undulated grass parrakeet presented by Dr. William R. Nicholson, Philadelphia.

" 18. 1 passerine ground dove presented by Lewis Kramer, Philadelphia. 8 golden pheasants born in the Garden.

" 20. 1 prairie rattlesnake, 6 yellow-bellied black snakes, 2 elegant bull snakes, 2 Emory's snakes, 6 hog-nosed snakes, 8 Say's pine snakes, 1 whip snake and 6 Holbrook's water snakes purchased.

" 22. 1 box tortoise and 1 painted terrapin presented by William D. Beisel, Philadelphia. 1 lemur, hybrid between black (♀ and mongoose ♂) born in the Garden. 3 banded rattlesnakes, 1 black snake and 1 garter snake presented by Samuel Scoville, Jr., Philadelphia.

" 23. 2 common crowned pigeons and 1 pine snake purchased. 2 prairie dogs born in the Garden.

" 24. 1 Levaillant's amazon presented by Charles Richardson, Philadelphia. 1 Eastern diamond rattlesnake, 1 black snake, 3 chicken snakes, 2 hog-nosed snakes, 2 yellow-bellied black snakes, 1 elegant bull snake, 1 Emory's snake, 1 red-skinned garter snake, 1 Say's pine snake, 3 whip snakes and 5 Western sand snakes purchased.

" 25. 2 European flamingoes purchased. 1 common horned lizard presented by C. E. Cox, Chalfont, Pa. 3 striped water snakes and 3 common water snakes presented by Douglass March, Pottstown, Pa.

May 26. 1 common macaque, 1 wild canary, 2 quail finches, 2 West African cutthroats, 2 blue-bellied finches, 2 regal whydah birds and 1 great blue heron purchased. 1 black snake and 1 ring-necked snake presented by P. F. Hamilton, Cochransville, Pa.

" 27. 2 summer ducks born in the Garden. 1 alligator presented by Marie Eichmann, Philadelphia.

" 28. 2 Virginia deer, 8 golden pheasants and 2 silver pheasants born in the Garden.

" 29. 1 Eastern diamond rattlesnake, 2 harlequin snakes, 5 black snakes, 2 chicken snakes, 1 corn snake, 5 Sacken's garter snakes, 6 hog-nosed snakes, 1 indigo snake, 5 king snakes, 2 banded water snakes, 3 brown water snakes and 4 whip snakes purchased.

" 30. 4 Amherst's pheasants born in the Garden.

" 31. 2 California hair seals purchased. 1 Himalayan tahr (♀) born in the Garden.

June 1. 1 canary bird presented by Mrs. Charles L. Leonard, Philadelphia. 4 banded rattlesnakes and 1 garter snake presented by Samuel S. Scoville, Jr., Philadelphia.

" 3. 10 rhesus monkeys and 2 vasa parrots purchased. 1 snapping terrapin presented by T. P. Chandler, Radnor, Pa.

" 4. 1 three-horned giraffe (♀), 1 Northern warthog (♀), 4 capybaras, 4 white-faced tree ducks, 4 fulvous tree ducks, 3 Japanese teal, 4 European widgeons, 4 pin-tailed ducks, 1 summer duck, 1 mandarin duck and 2 Chiloe widgeons purchased. 2 Indian antelopes (♂ and ♀) and 1 Northern warthog (♂) exchanged.

" 5. 2 common iguanas and 2 spiny comb lizards purchased. 2 alligators presented by Frederick A. Willitts, Philadelphia.

" 6. 2 white-nosed coatis and 2 hybrid sea gulls born in the Garden.

" 7. 1 gray wolf (♂) presented by William S. Febiger, Philadelphia.

" 7. 2 box tortoises presented by Charles Wood, Philadelphia.

" 8. 1 California hair seal (♀) born in the Garden.

" 9. 1 raccoon (♂) presented by the North Star New Year's Association, Philadelphia. 2 box tortoises presented by Mrs. John Lewis, Philadelphia.

" 10. 1 Jamaica lizard presented by Mrs. J. B. Thompson, Philadelphia. 1 alligator presented by Master William Ayres, Philadelphia. 1 red-bellied terrapin presented by Master Richard Schwoebel, Philadelphia.

" 12. 1 alligator presented by Albert Rochel, Philadelphia. 1 alligator presented by William Nice, Philadelphia. 1 bullfrog presented by Master Raymond Leahy, Philadelphia.

" 13. 1 bald eagle presented by John W. Welsh, Edgewood, Md.

" 14. 2 raccoons and 1 Japanese deer (♂) born in the Garden.

" 15. 1 grizzly bear (♀) and 2 cubs (♂ and ♀) from the Yellowstone Park presented by the Department of the Interior.

" 17. 1 great horned owl, presented by D. Mugrauer, Philadelphia.

" 18. 1 Japanese deer (♀) born in the Garden.

" 20. 1 Levaillant's amazon presented by Mrs. Warren Baker, Philadelphia. 1 horned lizard presented by Eugene Bassett, Puente, Cal.

" 22. 5 little white herons, 2 little blue herons and 7 Louisiana herons presented by E. A. McIlhenny, Avery Island, La. 4 gopher tortoises purchased. 1 pine snake presented by John F. Betz and Sons, Philadelphia.

June 23. 1 Japanese deer (♀) born in the Garden.

" 24. 2 turkey vultures and 1 darter purchased. 2 alligators presented by Miss Marjorie W. Canby and Master W. M. Canby, 3d, Germantown, Philadelphia.

" 25. 1 Japanese deer (♂) born in the Garden.

" 27. 2 black grouse purchased.

" 28. 1 peacock presented by C. Pardee, Philadelphia.

" 29. 1 diamond rattlesnake, 5 garter snakes and 4 rainbow snakes purchased.

July 2. 1 common waxbill presented by E. Buelow, Philadelphia. 1 spotted terrapin presented by Charles E. Ritter, Philadelphia. 1 banded rattlesnake purchased.

" 4. 6 banded rattlesnakes and 6 copperheads purchased.

" 5. 1 common troupial presented by Lawrence W. Fox, Jr., Philadelphia. 2 young turkey vultures presented by George S. Faucett, Philadelphia. 3 western diamond rattlesnakes purchased.

" 6. 3 painted terrapins and 6 musk turtles presented by Charles E. Ritter, Philadelphia.

" 8. 2 raccoons born in the Garden.

" 9. 1 American robin presented by Charles W. Cox, Philadelphia.

" 10. 1 rhesus macaque (♀) presented by Mrs. Maragaret Simon, Philadelphia.

" 11. 1 box tortoise presented by E. Peach, Philadelphia.

" 13. 1 alligator presented by Miss C. S. Barnes, Bryn Mawr, Pa.

" 17. 4 red-headed ducks born in the Garden.

" 18. 1 blue-fronted amazon presented by Miss Catharine Wolf, Philadelphia. 4 black ducks born in the Garden.

" 19. 1 wave-lined lizard presented by Mrs. E. M. Schymik, Philadelphia. 8 wave-lined lizards presented by John Young, Philadelphia.

" 20. 1 alligator presented by Wayne Cline, Philadelphia. 1 wave-lined lizard presented by Master Charles Schmalzried, Philadelphia.

" 21. 1 lion (♀) and 1 red deer (♂) born in the Garden.

" 23. 1 Indian antelope (♀) born in the Garden.

" 24. 1 loggerhead turtle presented by Master George Wood, Philadelphia.

" 26. 2 blue-bellied lorikeets and 1 red and yellow macaw purchased. 1 Cope's tree frog and 1 changeable tree frog presented by F. W. Cressey, Philadelphia.

" 28. 2 beautiful grass finches, 2 Gouldian grass finches, 2 crimson finches and 2 West African love-birds purchased.

" 30. 2 Cooper's hawks presented by Woodland Country Club, Chatsworth, N. J.

" 31. 1 Mexican black squirrel presented by Mrs. Rollin W. Van Horn, Philadelphia. 1 woodcock presented by Douglass W. Marsh, Philadelphia.

August 2. 1 great horned owl presented by G. Leiser, Muncy, Pa.

" 5. 1 horned lizard presented by J. F. Mayer, Philadelphia.

" 6. 1 yellow-ammer presented by P. F. Harpel, Philadelphia.

" 7. 2 Muhlenberg's terrapin and 1 box tortoise presented by Joe Dominicis, Philadelphia.

" 8. 17 common garter snakes born in the Garden.

" 9. 1 gray fox presented by Charles H. Mercer, Philadelphia. 19 common water snakes, 3 striped water snakes and 1 red salamander presented by Douglass H. March, Philadelphia.

August 13. 1 alligator presented by George W. Clapp, Philadelphia.

" 14. 1 monkey, hybrid out of grivet (♀) by vervet or Mozambique (♂) born in the Garden.

" 17. 1 gray fox presented by Dr. John R. Minehart, Philadelphia.

" 18. 1 yellow-shouldered amazon presented by Dory Jacobs, Philadelphia. 1 red-bellied terrapin presented by Dr. William L. Davies, Philadelphia.

" 22. 1 black snake presented by C. S. Wertsner, Philadelphia.

" 23. 3 Barbary turtle doves presented by Miss Marion Futer, Philadelphia. 9 Sacken's garter snakes born in the Garden.

" 24. 1 undulated grass parrakeet presented by R. B. Voorhees, Philadelphia

" 25. 1 common dasyure (♂), 1 shama thrush, 1 Gouldian grass finch, 2 orange-cheeked finches, 1 Senegal parrot, 2 Pennant's parrakeets, 2 banded parrakeets, 1 passerine parrakeet, 1 White's cyclodus, 1 gigantic zonurus, 1 muricated lizard, 1 Cunningham's skunk, 2 Chinese Reeves' terrapin and 2 red-eared terrapin purchased. 1 European land tortoise presented by F. Mitchell, New York.

" 29. 2 sooty mangabeys and 1 paradise whydah bird purchased.

Sept. 2. 1 grizzly bear (♂) from the Yellowstone Park presented by the Department of the Interior.

" 5. 1 wave-lined lizard presented by Melville Taylor, Philadelphia.

" 6. 1 prairie rattlesnake, 1 Faries' garter snake, 1 red-skinned garter snake, 4 hog-nosed snakes, 1 Say's king snake, 4 Western sand snakes and 4 Holbrook's water snakes purchased.

" 7. 1 Papuan cassowary purchased.

" 8. 1 yellow-fronted amazon presented by Mrs. R. MacMillan, Philadelphia. 1 copperhead presented by W. M. Anderson, Philadelphia.

" 9. 1 Rock thrush purchased. 1 alligator presented by Arthur Mansfield, Philadelphia.

" 10. 1 red deer (♀) born in the Garden.

" 11. 3 roe deer (♂ and 2 ♀ s) purchased. 7 copperheads born in the Garden.

" 13. 1 painted terrapin presented by Gilbert Randell, Philadelphia.

" 17. 2 banded rattlesnakes presented by S. M. Killen and C. Minnick, Philadelphia. 1 common water snake presented by D. H. March, Philadelphia.

" 20. 6 spiny-comb lizards presented by the New York Zoological Society.

" 21. 1 white-throated monkey, 1 Transvaal barbet, 1 blue-bellied lorikeet, 1 pale-headed parrakeet, 2 Eastern diamond rattlesnakes, 3 ground rattlesnakes, 1 harlequin snake, 2 black snakes, 5 chicken snakes, 1 corn snake, 1 Sacken's garter snake, 1 keeled green snake, 5 hog-nosed snakes, 1 red-bellied snake, 1 banded water snake and 1 whip snake purchased.

" 22. 5 ground rattlesnakes born in the Garden.

" 23. 1 Senegal parrot and 2 rosehill parrakeets purchased.

" 24. 1 alligator presented by Isaac Leonard, Philadelphia.

" 26. 1 bald eagle presented by James Maier, Philadelphia. 1 American salamander presented by F. G. Smeltz, Philadelphia.

" 27. 1 orange-winged amazon presented by Mrs. H. Mortensen, Philadelphia.

" 28. 1 harlequin snake, 1 black snake, 2 indigo snakes, 2 king snakes, 2 banded water snakes and 1 whip snake purchased.

Sept. 29. 2 Gila monsters purchased 3 alligators presented by Misses Louise and Elizabeth Shmidheiser, Philadelphia 16 European tree frogs presented by J. Hope, Philadelphia.
" 30. 1 aoudad (♂) born in the Garden.
Oct. 1. 1 American elk born in the Garden.
" 3. 1 alligator presented by Alexander Adaire, Philadelphia.
" 9. 1 alligator and 1 spotted terrapin presented by Elmer Rosenberger, Philadelphia.
" 13. 1 sulphur-crested cockatoo presented by Mrs. William W. Noble, Philadelphia.
" 14. 4 Japanese macaques (3 ♂s and 1 ♀) purchased. 1 red squirrel presented by Harmon Ryder, Philadelphia.
" 16. 1 diamond rattlesnake, 1 chicken snake, 1 American glass snake, 4 common garter snakes and 1 hog-nosed snake purchased.
" 17. 2 white peafowl purchased.
" 20. 1 diamond rattlesnake, 2 ground rattlesnakes, 2 chicken snakes, 1 corn snake, 4 common garter snakes, 1 Sacken's garter snake, 2 keeled green snakes, 1 indigo snake, 3 king snakes, 1 ring-necked snake, 4 whip snakes, 3 banded water snakes and 4 brown water snakes purchased.
" 24. 1 Indian antelope (♂) born in the Garden.
" 25. 1 pig-tailed macaque (♂) born in the Garden.
" 26. 1 wave-lined lizard presented by Mrs. William H. VanSickel, Philadelphia.
Nov. 1. 2 Canada porcupines and 1 spiny soft-shelled turtle presented by J. P. Culbertson, Carlisle, Penna. 1 alligator presented by Arthur Foehl, Philadelphia.
" 3. 1 diamond rattlesnake presented by J. B. Adkins, Otter Creek, Florida.
" 4. 1 barn owl presented by William H. Clausen, Philadelphia. 1 alligator presented by J. H. Cliffe, Philadelphia.
" 8. 1 banded rattlesnake presented by C. H. Shearen, Reading, Penna.
" 9. 1 rose-crested cockatoo, 2 roseate cockatoos, 2 rosebill parrakeets and 2 golden-naped amazons purchased.
" 18. 1 bald eagle and 1 red-tailed buzzard presented by J. P. Culbertson, Carlisle, Penna.
" 20. 1 prairie rattlesnake, 1 red-sided garter snake and 3 Say's pine snakes purchased. 1 red-tailed buzzard presented by Hiram J. Yoder, Harper, Kansas.
" 21. 2 Natal francolins purchased.
" 22. 1 Mexican deer (♂) presented by Major C. E. Gillette, Philadelphia.
" 24. 2 Western diamond rattlesnakes, 2 American crocodiles, 2 Hardwick's mastigures, 1 Egyptian mastigure 1 varigated teguixin, 2 starred lizards, 1 Caspian terrapin, 1 Clifford's snake and 1 hissing sand snake purchased.
" 25. 1 DeKay's snake presented by Paul W. Thomas, Philadelphia.
Dec. 2. 1 spotted terrapin presented by Henry Warmuth, Philadelphia.
" 4. 1 llama (♀) born in the Garden.
" 5. 2 hissing sand snakes purchased.
" 7. 1 Congo harnessed antelope (♂) purchased.
" 8. 2 alligators presented by C. Miller, Philadelphia.
" 9. 2 greenish white-eyes, 2 yellow-bellied buntings, 2 yellow-rumped seedeaters, 2 Smith's bullfinch larks, 1 short-toed lark, 2 Angolan finches, 2 scaly-fronted finches and 2 black-cheeked lovebirds purchased.
" 11. 3 painted terrapins presented by William Beisel, Philadelphia.
" 12. 1 blue-bearded jay purchased.

Dec. 16. 1 turtle dove presented by George H. Schofield, Philadelphia.
" 17. 2 American wild cats presented by Dr. Norton Downs, Three Tons, Penna. 1 raccoon presented by W. P. Crisfield, Philadelphia.
" 27. 1 pig-tailed macaque (♂) born in the Garden.
" 28. 1 opossum presented by Guy King, Philadelphia.
" 29. 1 alligator snapping turtle presented by Henry W. Young, Philadelphia.

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Jan. 15. 2 barn owls presented by Bernard Seed, Philadelphia.
" 26. 1 Eld's deer born in the Garden.
Feb. 1. 1 red-winged thrush, 1 fieldfare and 1 yellow-vented bulbul purchased.
" 2. 2 American bison (♂ and ♀) and 2 European brown bears (♂ and ♀) purchased.
" 4. 1 American badger purchased. 1 opossum presented by Mrs. E. A. Cassavant, Philadelphia.
" 8. 5 American beaver purchased.
" 12. 1 Canada porcupine presented by Dr. Charles B. Penrose, Philadelphia.
" 16. 1 chacma baboon (♀), 1 Guinea baboon (♀), 1 wolverine (♂), 1 peacock pheasant and 1 Himalayan monaul purchased. 1 Canada porcupine presented by A. W. McClement, Philadelphia.
" 17. 1 Cape hyrax purchased.
" 18. 1 opossum presented by The Walter Sanitarium, Walter's Park Philadelphia.
" 20. 2 golden-crowned conures, 12 crested ground parrakeets and 12 undulated grass parrakeets purchased.
" 24. 1 striated terrapin presented by J. Janssen, Philadelphia.
" 26. 2 American bison (♀ ♀) purchased.
" 28. 9 prairie dogs presented by Caspar Ostermaier, Philadelphia.

## REPORT OF THE LABORATORY FOR THE YEAR ENDING FEBRUARY 29TH, 1912.

The past year has been one of great activity for the laboratory. The mortality has been rather high, in part undoubtedly due to some tests we have made on small birds and to our attempts at cleaning out infected monkeys. There have been very few groups of cases upon which special comment can be made, aside from those included in the satisfactory work of Dr. Weidman upon parasites and our tuberculin tests. I shall, however, refer briefly to some conditions to which the laboratory's attention has been directed during this and previous years. At first is given a classified list, according to zoological orders, of the pathological diagnoses made at autopsy or by subsequent microscopical examination. The diagnoses, not always the causes of death, are listed in full as a matter of scientific record.

Total animals examined, 367.

Total *mammalia* examined, 105.

***Primates.*** Number examined, 29.

Diseases of the gastro-intestinal tract:
  Acute gastric dilatation, 1; enteritis, 8; gastritis, 2; gastric fermentation, 2.

Diseases of the circulatory system:
  Brown atrophy of heart muscle, 1; cloudy swelling of myocardium, 2; myocarditis, 1; sub-peri and endocardial hemorrhages, 1.

Diseases of the liver:
  Congestion, 1; cloudy swelling, 2; fatty change, 4; hepatitis, 1.

Diseases of the genito-urinary system:
  Amyloid of kidney, 1; congestion of kidney, 2; cloudy swelling of kidney, 2; hemorrhage into adrenal, 1; hypertrophy of adrenal, 1; congestion of adrenal, 1; chronic adrenalitis, 1; acute nephritis, 4; chronic nephritis, 2.

Diseases of the respiratory system:
  Broncho pneumonia, 2; congestion of lung, 1; emphysema, 1; hemorrhage into lung, 1; insular pneumonia, 1; petechial hemorrhages in lung, 1.

Diseases of the lymphatic system:
  Amyloid of spleen, 3; abscess of spleen, 1; chronic splenitis, 2; encysted parasites in spleen, 1; infarct of spleen, 1; lymphadenitis, 4; splenitis, 5.

Miscellaneous:

Anemia, 2; cartilaginous cyst of nose, 1; cellulitis of orbit and cheek, 1; empyema of antrum, 1; exposure, 2; chronic peritoneal adhesions, 2; laceration of scalp, 1; *tuberculosis, 12; unerupted tooth, 1; osteomalacia, 4; peritonitis, 2; parasites in stomach, 1; dipterous larvæ in omentum, 1; rickets, 1; septicemia, 1; decomposed, 2.

*Lemures.* Number examined, 5.

Abscess of root of tail, 1; enteritis, 2; fatty change in liver, 1; cloudy swelling of liver, 1; acute nephritis, 2; fatty change in kidney, 1; parasites in stomach, 1; parasites in intestine, 1; splenitis, 2; rickets, 1; injury, 1; decomposed, 2.

*Carnivora.* Number examined, 28.

Diseases of the gastro-intestinal tract:

Gastritis: 2 wild cats; 1 dingo; 1 weasel; 1 puma; 1 seal; 1 jackal; 1 leopard.
Enteritis: 2 wild cats; 1 digno; 1 puma; 1 bassaris; 2 seals; 1 fox; 1 skunk; 1 jackal; 1 kinkajou.
Collitis: 1 bassaris; 1 fox.
Intussusception with volvulus: 1 skunk.
Pancreatitis: 1 dingo; 1 badger; 1 coati.

Diseases of the circulatory system:

Atheroma of aorta: 1 jackal.
Cloudy swelling of heart muscle: 1 fox.
Hemorrhage into heart muscle: 1 fox.
Hypertrophy of heart: 1 badger.
Myocarditis: 1 seal.
Pericarditis: 1 seal.

Diseases of the liver:

Cirrhosis: 1 raccoon; 2 badgers; 1 leopard.
Congestion: 1 wild cat; 1 seal.
Cholangitis: 1 dingo; 1 jackal.
Cholecystitis: 1 jackal.
Cloudy swelling: 1 dingo; 1 seal; 1 jackal.
Fatty change: 1 weasel; 1 bassaris; 1 seal; 1 raccoon.

Diseases of the genito-urinary system:

Nephritis:
    Acute: 1 wild cat; 1 dingo; 1 weasel; 1 fox.
    Chronic: 1 seal; 1 leopard.
Congestion of the kidney: 1 wild cat; 1 jackal.
Fatty change in kidney: 1 raccoon.
Cloudy swelling of kidney: 1 seal; 1 kinkajou.
Diabetes mellitus: 1 fox.
Abortion: 1 raccoon.
Acute hemorrhagic metritis: 1 jackal.

Diseases of the respiratory system:

Congestion of lung: 1 wild cat; 1 seal.
Atelectasis: 1 wild cat.
Encysted flukes in lung: 1 wild cat.
Edema of lung: 1 seal.
Emphysema of lung: 1 raccoon.
Broncho-pneumonia: 1 puma; 2 seals.
Pleuritis: 1 seal.

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* See note on tuberculin reaction.

Diseases of the lymphatic system:

Amyloid of spleen: 1 raccoon.
Congestion of spleen: 1 wild cat; 1 jackal.
Splenitis: 1 dingo; 1 weasel; 1 fox; 1 puma; 1 badger; 1 leopard; 1 seal.
Lymphadenitis: 1 wild cat; 1 dingo; 1 puma; 3 seals; 1 fox; 1 leopard.

Miscellaneous:

Corneal ulcers: 1 lion.
Chronic thyroiditis: 1 dingo.
Endothelioma of the pleura: 1 leopard.
Hypernephroma of adrenal: 1 seal.
Injury: 1 seal; 1 raccoon.
Decomposed: 1 fox.
Osteomalacia: 1 raccoon.
Parasites in stomach: 1 wild cat.
Parasites in intestines: 1 wild cat.
Parasites in thigh muscles: 1 wild cat.
Parasites in blood: 1 wild cat.
Peritonitis: 1 seal; 1 jackal.
Potential hernia: 1 lion.
Shock: 1 coati.
Tuberculosis: 1 coati.
Ulcers in abdominal skin: 1 lion.
Undetermined: 1 wild cat; 1 coati.

*Rodentia.* Number examined, 18.

Diseases of the gastro-intestinal tract:

Enteritis: 1 hamster; 1 woodchuck; 1 dormouse; 2 capybaras; 2 beaver.
Gastritis: 1 beaver; 1 hamster.
Pancreatitis: 1 capybara.

Diseases of the circulatory system:

Pericarditis: 1 woodchuck.
Endarteritis: 1 hamster.

Diseases of the liver:

Fatty change in liver: 2 hamsters; 1 beaver.
Hepatitis: 1 woodchuck; 1 beaver.
Adenoma simplex of liver: 1 woodchuck.
Congestion of liver: 1 beaver.
Cholelithiasis and cholecystitis: 1 beaver.

Diseases of the genito-urinary system:

Subcapsular hemorrhage in kidney: 1 dormouse.
Cloudy swelling of kidney: 1 dormouse.
Cystitis: 1 dormouse.
Cystic kidneys: 1 agouti.
Acute nephritis: 1 hamster.
Chronic nephritis: 1 woodchuck; 1 beaver.
Hypernephroma of kidney: 1 squirrel.
Old anemic infarct in kidney: 1 capybara.
Salpingitis: 1 rat.
Hypertrophy of medulla of adrenal: 1 hamster.

Diseases of the respiratory system:
- Congestion of lung: 1 spermophile.
- Edema of lung: 1 spermophile; 1 beaver.
- Pneumonia: 1 agouti.

Diseases of the lymphatic system:
- Splenitis: 2 woodchucks; 2 beavers.

Miscellaneous:
- Peritonitis: 1 beaver; 1 rat; 2 capybaras.
- Injury: 1 squirrel; 1 capybara.
- Decomposed: 1 squirrel; 1 agouti; 1 spermophile; 1 rat.
- Ascites: 1 woodchuck.
- Purulent otitis media: 1 hamster.
- Mediastinal abscess: 1 hamster.

*Ungulata.* Number examined, 13.

Diseases of the gastro-intestinal tract:
- Gastritis: 1 gnu; 1 boar.
- Enteritis: 1 sheep; 1 deer; 1 boar.
- Colitis: 1 boar.
- Gastric fermentation: 1 sheep; 1 boar.
- Impaction of stomach: 1 antelope.

Diseases of the circulatory system:
- Acute dilatation of heart: 1 deer.
- Edema of heart muscle: 1 boar.
- Fibrous placque in aorta: 1 deer.
- Hemorrhage into heart muscle: 2 deer.
- Myocarditis: 1 mouflon.
- Tenia echinococcus in pericardium: 1 sheep.

Diseases of the genito-urinary system:
- Abscess of kidney: 1 bison.
- Acute distention of bladder: 1 boar.
- Chronic cystitis: 1 boar.
- Epithelial necrosis of kidney: 1 boar.
- Chronic nephritis: 1 mouflon.
- Endometritis: 1 bison.
- Retention of dead fetus: 1 bison.
- Chronic prostitis and cowperitis: 1 boar.

Diseases of the liver:
- Abscess of liver: 1 bison.
- Passive congestion of liver: 1 boar.

Diseases of the respiratory system:
- Congestion and edema of lungs: 1 antelope.
- Infarct in lung: 1 bison.
- Parasitic cyst in lung: 1 antelope.

Diseases of the lymphatic system:
- Lymphadenitis: 1 sheep; 1 boar.
- Splenitis: 1 boar.

Miscellaneous:
- Abscess of parotid gland: 1 gnu.
- Arthritis: 1 antelope; 1 mouflon.
- Cellulitis of scalp: 1 gnu.
- Echinococcus cysts in omentum: 2 deer.
- Goitre: 1 gnu.
- Hemorrhagic pancreatitis: 1 deer.
- Hernia: 1 antelope.

Injury: 1 antelope; 1 deer.
Osteomalacia: 1 gazelle.
Osteofibroma: 1 gazelle.
Pyemia: 1 bison.
Shock: 2 deer.
Tuberculosis: 1 gnu; 1 mouflon; 1 antelope.
Anemia: 1 gazelle.

*Marsupialia.* Number examined, 12.

Diseases of the gastro-intestinal tract:
Gastritis: 1 opossum; 1 kangaroo.
Enteritis: 1 opossum.
Typhlitis: 1 wallaby.
Ileus: 1 wombat.
Constipation: 1 wallaby.

Diseases of the circulatory system:
Acute dilatation of heart: 1 opossum.
Cloudy swelling of myocardium: 1 kangaroo; 1 fox; 1 opossum.
Pericarditis: 1 opossum.
Endocarditis: 3 opossums.
Myocarditis: 1 opossum.
Hypertrophy of heart: 1 opossum.

Diseases of the liver:
Cirrhosis: 1 wallaby.
Cloudy swelling: 2 kangaroos; 2 opossums.
Fatty change: 1 opossum; 1 wombat.
Hepatitis: 1 opossum.

Diseases of the genito-urinary system:
Cloudy swelling of kidney: 1 opossum.
Chronic choledochitis communis: 1 wallaby.
Acute nephritis: 2 kangaroos; 3 opossums; 1 wombat; 1 wallaby.

Diseases of the respiratory system:
Broncho-pneumonia: 1 opossum.
Congestion of lung: 1 wombat.
Edema of lung: 1 wombat.

Diseases of the lymphatic system:
Amyloid of spleen: 1 kangaroo.
Lymphadenitis: 2 kangaroos; 2 opossums; 1 wombat.
Splenitis: 4 opossums; 1 fox; 1 kangaroo; 1 wombat; 1 wallaby.

Miscellaneous:
Abscess of floor of mouth: 1 kangaroo.
Acute infection: 1 opossum.
Dermatitis: 1 wallaby
Localized cellulitis: 1 kangaroo.
Decomposed: 1 wallaby.
Osteomyelitis: 1 kangaroo.
Mesenteric thrombosis: 1 wombat, 1 opossum
Peritonitis: 1 opossum; 1 wombat.
Pyrrhœa alveolaris: 1 kangaroo.
Parasitic cyst in pectoral muscle: 1 opossum.
Parasites in stomach: 4 opossums.
Parasites in intestines: 1 wombat.
Septicemia: 1 kangaroo; 1 opossum.
Tuberculosis: 1 opossum.
Toxemia: 1 wombat.
Chronic myositis: 1 wallaby.

Total *aves* examined, 255.

*Passeres.* Number examined, 65.

Diseases of the gastro-intestinal tract:

Gastritis, 3; enteritis, 16; colitis, 3; impaction of intestine, 1; impaction of proventricle, 1; impaction of cloaca with urates, 1; impaction of esophagus, 1.

Diseases of the circulatory system:

Cloudy swelling of myocardium, 1; rupture of right auricle, 1; pericarditis, 1.

Diseases of the liver:

Cloudy swelling, 1; biliary pigmentation, 1; fatty change, 5; focal necrosis, 1; hepatitis, 1.

Diseases of the genito-urinary system:

Acute nephritis, 2; cloudy swelling of kidney, 1; fatty change in kidney, 1.

Diseases of the respiratory system:

Bronchitis, 1; congestion of lung, 3; edema of lung, 1; hemorrhage into thoracic air sacs, 2; hemorrhage into lung, 1; pneumonia, 2.

Diseases of the lymphatic system:

Splenitis, 4.

Miscellaneous:

Acute infection, 2; anemia, 2; carcinoma of thyroid, 1; decomposed, 25; congestion of pancreas, 1; chronc interstitial orchitis, 1; dislocation of left femur, 1; asphyxia, 1; filiariasis, 1; general obesity, 22; general toxemia, 1; injury, 8; not posted, 1; undetermined, 5; mould infection, 1; petechial hemorrhages, 1; spiroptera in proventricle, 1; parasites in blood, 2; parasites in intestine, 5; parasites in serosa of proventricle, 2; pancreatitis, 1; peritonitis, 2.

*Picariæ* Number examined, 3.

Enteritis, 1; hepatitis, 1; acute nephritis, 1; chronic nephritis, 1; gas infection of liver, 1; splenitis, 2; spiroptera in proventricle, 2; bird diphtheria, 1.

*Psittaci.* Number examined, 81.

Diseases of the gastro-intestinal tract:

Enteritis, 22; duodenitis, 4; rupture of proventricle, 1; congestion of intestine, 2; distention of proventricle with mucus, 1; mucous degeneration of mucosa, 1; separation of gastric serosa, 1; distention of crop, 1; impaction of intestine, 1.

Diseases of the circulatory system:

Pericarditis, 3; cloudy swelling of heart muscle, 6; fatty change in heart muscle, 1.

Diseases of the liver:

Abscess, 3; biliary abscesses, 1; congestion, 1; cloudy swelling 4; fatty change, 2; focal necrosis, 2; hepatitis, 4.

Diseases of the genito-urinary system:

Congestion of kidney, 1; cloudy swelling of kidney, 2; fatty change in kidney, 2; cyst and abscess in kidney, 1; nephritis, acute, 2, chronic, 1; papillary adenoma of kidney, 1; adeno-carcinoma of oviduct, 1.

Diseases of the respiratory system:

Anthracosis, 1; broncho pneumonia, 2; congestion of lungs, 4; edema of lungs, 3; pleuritis, 2; serositis, 9.

Diseases of the lymphatic system:

Splenitis, 13.

Miscellaneous:

Acute infection, 3; anemia, 2; general congestion, 1; decomposed, 13; chronic peritoneal adhesions, 1; healthy, 1; injury, 3; lateral curvature of spine, 1; membranous conjunctivitis, 1; peritonitis, 5; undetermined, 6; starvation, 3; spiroptera in proventricle, 24; parasites in blood, 1, in intestine, 1; tuberculosis, 7; pancreatitis, 1.

*Striges.* Number examined, 9.

Enteritis, 3; hepatitis, 1; traumatic hemorrhage in duodenum, 1; congestion of kidney, 1; salpingitis, 1; congestion of lung, 1; undetermined, 1; anemia, 1; decomposed, 3.

*Accipitres.* Number examined, 24.

Diseases of the gastro-intestinal tract:

Gastritis, 2; enteritis, 10; distention of crop, 1.

Diseases of the circulatory system:

Arterosclerosis, 1; cardiac hypertrophy, 1; endaortitis, 1; mesarteritis, 1; obliterating endarteritis, 1; endocarditis, 1; myocarditis, 5; pericarditis, 3.

Diseases of the liver:

Cloudy swelling of liver, 2; hepatitis, 1; fatty change, 1; congestion, 1.

Diseases of the kidney:

Nephritis, acute, 1, chronic, 2.

Diseases of the respiratory system:

Congestion of lung, 1; edema of lung, 1; hemorrhage of lung, 1.

Miscellaneous:

Chronic pleural adhesions, 1; tuberculosis, 1; injury, 1; mould infection, 1; splenitis, 5; undetermined, 4; obesity, 1; jaundice, 3; general fibrosis, 1; serositis, 1; retroperitoneal sarcoma, 1.

*Columbæ* Number examined, 14.

Enteritis, 4; parasites in intestine, 1; spiroptera in proventricle, 2; cloudy swelling of heart muscle, 1; cirrhosis of liver, 1; cloudy swelling of kidney, 1; congestion of lung, 1; tuberculosis, 8; decomposed, 3.

*Galli.* Number examined, 8.

Gastritis, 1; enteritis, 4; verminous typhlitis, 1; chronic adhesive pericarditis, 1; fatty change in liver, 1; biliary pigmentation in liver, 1; necrosis of liver, 1; splenitis, 2; edema of larynx and syrinx, 1; spiroptera in proventricle, 1; parasites in blood, 1; injury, 1; broken egg, 1; tuberculosis, 1; decomposed, 1.

*Fulicariæ.* Number examined, 4.

Enteritis, 2; colitis, 1; parasites in proventricle, 1; pericarditis, 1; myocarditis, 1; cloudy swelling of liver, 2; hemorrhage in liver, 1; acute nephritis, 1; cloudy swelling of kidney, 1; splenitis, 2; hemorrhagic septicemia, 1; injury, 1; decomposed, 2.

*Alectorides.* Number examined, 2.

Enteritis, 1; parasites in proventricle, 1; tuberculosis, 1; decomposed, 1.

*Steganopodes.* Number examined, 1.

Enteritis, 1; congestion of pancreas, 1; hepatitis, 1.

*Herodiones.* Number examined, 15.

Diseases of the gastro-intestinal tract:

Enteritis, 1; colitis, 1; coprolith in cloaca, 1; pseudomembranous proctitis, 2; distention of proventricle with fish, 1; constipation, 1.

Diseases of the circulatory system:

Aortic and mitral valvulitis, 1; fatty change in heart, 1; pericarditis, 1; hemorrhage into air sacs from ruptured vessel, 1.

Diseases of the liver:

Cloudy swelling, 1; fatty change, 3; hepatitis, 1; infarcts in liver, 1; perihepatitis, 1.

Diseases of the kidney:

Chronic nephritis, 1; fatty change, 1.

Diseases of the respiratory system:

Hemorrhage in lung, 1; abscess of lung, 1; edema of lung, 1.

Diseases of the lymphatic system:

Splenitis, 3.

Miscellaneous:

Enterolithiasis, 1; periostitis, 1; anemia, 4; injury, 2; parasites in proventricle, 8, intestine, 3, peritoneum, 1, gizzard wall, 2, proventricular wall, 3; decomposed, 1; general congestion, 1; peritonitis, 1; parasitic cyst in cloaca, 1.

*Anseres.* Number examined, 23.

Diseases of the gastro-intestinal tract:

Enteritis, 8; colitis, 1; pseudo membranous esophagitis, 1; congestion of pancreas, 1.

Diseases of the circulatory system:

Pericarditis, 3; myocarditis, 1; endarteritis nodosa, 1; atheroma of aorta, 2; hypertrophy and dilatation of heart, 1; cloudy swelling of heart muscle, 1; brown atrophy of heart, 1.

Diseases of the liver:

Cirrhosis, 1; cloudy swelling, 4; congestion, 2; necrosis, 1; fatty change, 1.

Diseases of the respiratory system:

Congestion of lung, 1; edema of lung, 1.

Diseases of the kidney:

Chronic nephritis, 1; fatty change, 2; cloudy swelling, 2.

Miscellaneous:

Splenitis, 6; mould infection, 3; septicemia, 2; tuberculosis, 1; injury, 4; decomposed, 3; concussion of brain, 1.

*Struthiones.* Number examined, 4.

Gastritis, 2; enteritis, 3; cirrhosis of liver, 1; cloudy swelling of liver, 2; pericarditis, 2; myocarditis, 1; hypertrophy of heart, 1; acute nephritis, 1; cloudy swelling of kidney, 1; splenitis, 3; acute infection, 2; diffuse hemorrhages, 1; naso pharyngitis, 1; serositis, 1.

*Limiicolicæ.* Number examined, 1.

Spiroptera incerta in proventricle, 1.

*Gaviæ.* Number examined, 1.

Enteritis, 1; parasites in proventricle, 1; splenitis, 1.

Total *reptilia* examined, 9.

*Squamata.* Number examined, 5.

Tuberculosis, 1 iguana; duodenitis, 1 lizard; parasites in cloaca, 1 lizard.

*Testudinata* Number examined, 3.

Gastritis, 1 turtle; 2 tortoises.

Enteritis, 2 tortoises; 1 turtle.

Ascariasis, 1 tortoise.

Tuberculosis, 1 tortoise; 1 turtle.

Subperitoneal filaria, 1 monitor.

*Crocodilini.* Number examined, 1.

Decomposed, 1.

The following brains have been examined without finding any pathologic change (Dr. W. B. Cadwallader):

Hamadryas baboon, white-collared mangabey, California hair seal, gray fox, 3 wild cats, black lemur, 2 weeper cebus, brown cebus, common macaque, green monkey, striped spermophile, 2 black-tailed wallabys.

## Tuberculin Reaction in Monkeys.

On March 1st, 1911, there were three monkeys left in the detention rooms for retesting. During the year we have received twenty-three new animals. During the previous year we had four deaths from tuberculosis, but early after the beginning of this past fiscal year several more monkeys died from the same disease. It was then decided to retest all the monkeys in the collection. The animals were brought to the infirmary in convenient groups, tested and returned to the outer cages. When the inside cages had been emptied, the whole inside of the monkey house was disinfected by formaldehyde gas and thoroughly washed. The monkeys were then returned to the inside exhibition cages. The whole number of tests made during this year was 123, representing 23 new and 50 old monkeys. Forty-three monkeys were tested two or more times. Our methods of handling the animals have been the same except that slightly larger doses of the tuberculin have been used. I find a more pronounced reaction with one and a half or two milligrams in the rhesus macaques and small baboons and usually the dose is doubled on secondary test. Of the twenty-three monkeys received this year two have died of tuberculosis and two without showing it. The other 10 dying from tuberculosis were passed before the first of March, 1911. Five of the twelve tuberculous animals died on exhibition, the remaining seven in the laboratory where they were returned for retesting or were detained for poor condition awaiting a further test.

In the last report we described the history of Red Monkey No. 21. At the beginning of the year he was waiting for another injection and he was killed after this although his temperature record was not bad. His history and association with infected monkeys were enough to condemn him. In the lungs and bronchial glands there were a few small fibro-caseous nodules about two or three millimetres in diameter. These contained a few scattered bacilli. Why these lesions did not give a reaction is difficult to say since I have seen as minute a focus give a pronounced temperature variation (C. Y. White and H. Fox, Rept. VII, Tuberculosis Cong., 1908, V. IV).

At all events Red Monkey No. 21 come from bad monkeys, had been associated with infected animals and was in the same cage as four of the monkeys dying with tuberculosis this year. We are satisfied at having sacrificed him, although deaths from this disease continued up to December 19th. His death certainly removed one source of infection. All the deaths cannot be satisfactorily explained, but four of the list this year were associated with Red Monkey No. 21. Only in one case does it seem probable that a more rigid interpretation of the temperature chart would have held the animal in quarantine. No deaths from tuberculosis have occurred since 12/19/11. We have interpreted the last series of charts very rigidly and held up, in one case four times, the transfer to exhibition cages when the charts were unsatisfactory. There are no monkeys in the laboratory building at the end of the year. Four of the seven monkeys showing tuberculosis were killed very shortly after injection, the remaining three either dying or being killed some time later. I shall give a short history of each of the twelve tuberculous animals.

Our rather disappointing experience this year indicates three things to me very clearly. First slightly larger doses among macaques and baboons are advisable. Secondly, all charts must be viewed very critically and no irregularities allowed to pass. Thirdly, and most important, it is advisable to test the whole group of monkeys at least every two years. It would not be a bad thing to do it every year but this would require unlimited resources. Great care is being taken with the feeding of the animals and cleaning of their cages. Separate utensils are used for each monkey. Thermometers are soaked in bichloride solution between usings. All animals are washed with soap and water and rinsed with carbolic acid solution upon arrival and when sent to the exhibition cage.

2191. Red Monkey No. 21. History given above and in 1911 report. Injected for the last time 3/10/11. Gave a rather good temperature curve but of low range. Killed. Tuberculous.

2192. White-throated Monkey No. 11. Received 9/20/10. Passed 9/30/10. Associated with several monkeys, among them Sooty Mangaby No. 65 after the death of which (2/3/11) he was returned to the infirmary and killed on 3/10/11 because of poor condition, while awaiting a test. He was associated also with Red Monkey No. 21.

2207. Rhesus Macaque No. 130. Received 5/28/06. Had been injected twice but finally passed to Monkey House 3/20/07 on a good chart. Associated from the first with Rhesus Macaque No. 115 (1911 report) which showed a cryptogenic case on 2/16/11. Rhesus No. 130 returned to detention room and died 4/12/11.

2213. Barbary Ape No. 9. Received 2/19/11. Passed on a perfectly good chart 2/18/11. Associated with no tuberculous monkeys. Died 4/17/11 with an acutely advancing tuberculosis.

2268. Rhesus Macaque No. 135. Received 3/18/11 and passed 3/27/11 to be associated with a group in which two cases developed later, White-collared and Sooty Mangabeys (see list below), died 6/10/11 rapid acute lesions.

These two now to be described had been associated with Sooty Mangabey No. 65 (see 1911 report), but had given unexceptionable charts thereafter.

2281. White-collared Mangabey No. 13. Received 6/18/10. Injected twice passed to be associated with Sooty Mangabey No. 65 (see above) and Red Monkey No. 21. When retested after the death of the former he passed well and was associated with a group in which were Rhesus Macaque No. 135 and Sooty Mangabey No. 70 (see below). When the macaque died he was brought to the laboratory to be retested but died 6/23/11.

2328. Sooty Mangabey No. 70. Received 5/9/10. Passed on an excellent chart to be associated with a group in which there were Red Monkey No. 21, White-collared Mangabey No. 13, White-throated Monkey No. 11, and Sooty Mangabey No. 65 (see below). He was tested after the death of Sooty Mangabey No. 65, gave a perfect chart and then came in contract with a group containing Rhesus Macaque No. 135. When this one died he was returned but died shortly.

2318. Weeper Cebus No. 55. Received 11/16/07. Passed and was in indoor exhibition cage three and one-half years not exposed to an infected animal. Then retested to be put into large outdoor (band-stand) cage. No tuberculous monkey in his associates yet put into cage 6/10/11 and died 7/27/11 with miliary tuberculosis. This appears like a case from feeding by visitors.

2423. Stair's Monkey. Received 4/28/09. Passed to be associated with Red Monkey No. 21, Sooty Mangabeys No. 65 and No. 70. He was tested twice after the death of Sooty Mangabey No. 65 and passed to the band-stand cage where he was exposed to Weeper Cebus No. 55. He may of course have carried the organisms on his hair as we assume also that Red Monkey No. 21 and others have done.

2428. Long-armed Baboon No. 2. Received 11/11/09. Passed along with Reddish Macaque No. 1 (see 1911 report) which had tuberculosis. After the death of this animal he gave a good chart. He was returned for the general injection in 1911 but did not give a satisfactory chart and was held. Died 11/1/11 with a small lesion which could hardly be dated as far back as the Reddish Macaque's case.

2453. Red Monkey No. 22. Received 2/2/11. Passed on a faultless chart to be associated with a group in which Barbary Ape No. 9 was. He was returned when this monkey died, retested twice and held each time. Died 11/27/11 of rapidly advancing lesions.

2482. Rhesus Macaque No. 145. Received 6/3/11. Passed to the band-stand cage where Weeper Cebus

No. 55 and Stair's Monkey No. 1 were. He was tested twice after Weeper Cebus No. 55 died, and finally killed.

To sum up this list we find the Red Monkey No. 21 and four others in one group easily connected and by our records of the movements of monkeys associated with the group of three consisting of Weeper Cebus No. 55, Stair's Monkey No. 1, and Rhesus Macaque No. 145. The connection in this instance consists in the association of Stair's Monkey No. 1 with Red Monkey No. 21 and Sooty Mangabey No. 65 and No. 70 before it was passed to the band-stand cage. Then we have two together, Barbary Ape No. 9 and Red Monkey No. 22, the first infecting the latter although not previously associated with an infective monkey. Then there is one Rhesus Macaque No. 130 apparently infected last year by its mate Rhesus Macque No. 155. The last, Long-armed Baboon No. 2 was not connected in either way with an infected monkey close enough to cause its rather early lesion. It has been possible to follow the changing of cages of every animal by our cross index catalogue and we hope by this means to check further cases by isolating any animal that may have been exposed.

## Other Tuberculin Reactions.

We have tested several kinds of animals by the tuberculin test both subcutaneously injected or dropped into the conjunctival sac. In regard to the latter we have performed the test upon two tuberculous and one healthy Hog Deer. One of the tuberculous animals gave a positive reaction while the other and the healthy deer were negative to the test. Subcutaneously we have tested three bison, a zebu, a camel, an elk and a Virginia deer. Two of the bison gave negative results and on one this was corroborated by autopsy. One gave a positive reaction and was found tuberculous when killed. Their temperature ranges from 101° to 103° F. without any definite daily rhythm. The zebu gave a fairly definite reaction and was found tuberculous. Her temperature before injection was very irregular. The camel failed to respond and was found to be free from tuberculosis when posted two and one-half years later. Her temperature was very irregular. The elk gave a negative reaction. Her temperature ranged from 101° to 102° F. without rhythm. The Virginia deer did not react. Its freedom from tuberculosis has not been corroborated by autopsy. Its temperature varied from 100° to 102° F. with a decided tendency to rise at 8 P. M. and stay low in the morning. The doses of tuberculin for subcutaneous injection have been based upon weights. 400 milligrams is used for testing an ordinary cow, say of 500 pounds. For these wild animals I have used a quantity slightly greater than that bearing a proportion to the weights. If a deer weigh 100 pounds I have used, not one-fifth of this 400 milligrams, but one-fourth. The results seem satisfactory.

## THE PARASITES.

There have been 74 animals showing parasites of some kind, among our autopsies this year. Some of these have been determined as appears below. Most of our time, however, has been spent upon the worms found in the proventricle of parrots and upon a filarial worm found in a wild cat. Dr. Weidman has been doing this work and his report will be found in the succeeding pages. He has analyzed all the deaths of wild cats and comes to the conclusion that in all probability the animal's resistance is lessened by acting as the host of parasites. Our former pathologist, Dr. White, took the position that worms were not of any great moment in the sickness and death of animals. From my experience I see no reason to differ with him. Nevertheless it is noteworthy that many of the cats, heavily infested with worms, died shortly after arrival. Very few bacteriological examinations have been made upon feline enteritides but those at hand show no particular connection between the different cases. In general those cats without worms lived in the garden longer than the infested ones. For these reasons it would seem better, for the present at least, not to exculpate the parasites from lowering the animals' resistance.

The progress of Dr. Weidman's work upon parrots proventricular *spiroptera* speaks for itself. There is every indication that shortly we shall be able to exclude *filaria*-bearing birds from the parrot house. That we shall learn something of their life history we hope. This is always a tedious and difficult task. It is to be expected that any success we may have in treatment will be empirical or accidental and that a perfectly satisfactory method of cure and hygienic control must await our discovery of the life history and transmission.

The following are the determined parasites aside from those in Dr. Weidman's reports:

Weeper Cebus (*Cebus capucinus*):
  *Filaria gracilis* in peritoneum.
Burchell's Zebra (*Equus burchelli burchelli*):
  *Ascaris megalotyphlon* in duodenum.
Black Bear (*Ursus americanus*):
  *Ascaris transfuga* in small intestine.
Black-crested Cardinal (*Gubernatrix cristata*):
  *Proteosoma* in red blood cells.
Woolless Sheep (*Ovis aries*):
  *Tenia echinococcus* in pericardium.
Mule Deer (*Mazama hemionus*):
  *Cysticercus tenuicollis* in peritoneum.
Great Blue Heron (*Ardea herodias*):
  *Ascaris ardea* in ceca.

## OBSERVATIONS ON PARASITES IN WILD CATS.

Dr. F. D. Weidman.

During the past year special work has been done towards solving the cause of the high mortality among wild cats and parrots.

The Wild Cats (*Felis ruffus*):

Since 1902 there have been nineteen deaths as shown by the following table:

| Lab. No. | Date of Death. | Clinical Notes. | Pathological Diagnosis. | Parasites. | Time in Garden. |
|---|---|---|---|---|---|
| 24 | 3–17–02 | Vomiting. Loose bowels. | Parenchymatous nephritis. Hemorrhagic gastro-enteritis | Intestinal and bronchial | 19 days. |
| 138 | 12– 4–03 | Had a fit | Abscess of external ear | | 3 yrs and 10 mo. |
| 1439 | 7–17–08 | Vomit. Bloody stools | Acute follicular enteritis | Cestodes in intestine | 5 mo. |
| 1442 | 7–19–08 | Bloody stools | Cloudy swelling of liver and kidney. Acute entero colitis. Gangrene of lung | None mentioned | 5 mo. |
| 1585 | 2–19–09 | Injured leg when received. | Not posted. Eaten by mates | None mentioned | 8 days. |
| 1586 | 2–20–09 | Vomited worms | Not posted. Eaten by mates | None mentioned | 9 days. |
| 1588 | 2–24–09 | Vomited worms | Atheroma and aneurysm of aorta. Acute hemorrhagic gastro entero colitis | Nematodes and cestodes in intestine | 13 days. |
| 1593 | 3– 2–09 | Anorexia | Cloudy swelling of liver and kidney. Intestinal toxemia | None mentioned | 3 mo. |
| 1715 | 8–10–09 | Fits | Follicular hyperplasia Chronic gastro-entero colitis | None mentioned | 2 mo. |
| 1758 | 10–10–09 | Anorexia. Fits | Acute entero colitis | Nematodes in stomach | 1 mo. |
| 1840 | 2–13–10 | Convulsions | Mucous enteritis. Atheroma of aorta | Nematodes and cestodes in intestines. Filaria in hip muscles | 1 mo. |
| 1844 | 2–17–10 | Bloody stools | Acute gastro-enteritis | Nematodes in stomach and intestine. Filaria in thigh muscles | 1 mo. |
| 1860 | 3–16–10 | None | Acute parenchymatous nephritis. Chronic mesenteric lymphadenitis | Nematodes in stomach and thigh. Cestodes in intestine | 15 days. |
| 1863 | 3–20–10 | No distinct symptoms | Acute lymphatic hyperplasia. Mucous pseudo membranous enteritis | Nematodes in intestine | 19 days. |
| 2122 | 1–14–11 | Vomit worms. Bloody stools | Acute lymphadenitis. Chronic mucous colitis | None mentioned | 1 mo. |
| 2135 | 1–25–11 | Fits. Unconsciousness | Acute parenchymatous nephritis. Acute catarrhal enteritis | Nematodes and cestodes in intestine. Paragonimus Westermanii in lung. Filarial worms in blood | 13 mo. |
| 2178 | 3– 8–11 | Vomit. Bloody stools | Acute parenchymatous nephritis. Chronic fibrous atrophic gastritis. Chronic catarrhal gastro enteritis | None mentioned | 10 days. |
| 2179 | 3– 9–11 | Anorexia. Loose stools | Acute lymphadenitis. Acute hemorrhagic gastro enteritis | Flukes in lung. Nematodes in stomach. Cestodes in intestine. Filaria in thigh muscles | 11 days. |
| 2392 | 7–28–11 | Paralysis in hind quarters. | Undetermined | None found | 9 yrs. |

The above table shows that nine out of nineteen showed either loose bowels or had vomited, indicating the gastro-intestinal tract as the organ at fault. In five cases the stools were bloody. In three cases worms were vomited. Only two of the animals at autopsy failed to show a frank inflammation, either acute or chronic, of the alimentary canal. That these were outspoken cases and could admit of no error in diagnosis is evinced by the frequency with which the terms "hemorrhagic," "follicular" and "membranous" appear. The lymphadenitis so frequently mentioned of late refers to the mesenteric nodes, and is secondary to the primary lesion.

In regard to the parasites, cats of all kinds are notorious for harboring worms. Neumann discusses the *Bothriocephalus felis* and concludes by saying that "it is not known that they do the animals any harm." The fact that the wild cat living here longest (2392), *i. e.*, nine years, showed no worms anywhere, even upon careful search, and that the same is true of the next oldest inhabitant (138) who was here three years and ten months, may have some bearing upon this subject.

The table shows that five of the cats harbored *filariæ*. This worm is found coiled in a most intricate manner in the loose areolar tissue of the intermuscular *fasciæ*, generally in the thigh muscles. In the one case seen by me it was between the internal abdominal and psoas muscles. The tail, from which much might have been gained for identification, was lost in extracting. This specimen was a female, measured 25 Cm. in length, 0.5 Mm. in breadth. The head is simple, lips simple, cephalic extermity bluntly rounded. Esophagus straight. From the broken end projected the gut and two ovarian tubes.

This worm, as with all *filariæ*, was viviparous. The still living embryos from abdominal aorta of cat measure 280 to 330 microns in length, 4 microns in breadth. They have a delicate sheath, a lashing motion, and no progression. Stained specimens exhibit deep blue spots at irregular intervals, not uniformly enough to be established as head or tail spots.

The specimen is probably *filaria striata* (Molin). The uncertainty of diagnosing *filariæ* may be appreciated when Molin is quoted from his comprehensive monograph that he could not diagnose some of the cases because they had no outspoken characteristics. This uncertainty is increased by the brevity of the type descriptions. *Filaria striata* is described as follows:

*Os inerme, minimum; corpus filiforme, longissimum, tenuissime transversim stratum; extremitas anterior crassior; et posterior obtusæ; extremitas caudalis maris laxe spiraliter torta, foveala ante apicem limbo cincta, septem papillis permagnis utrinque prædita; vagina breve tubulosa; penis brevissimus uncinatus; extremitas caudalis femine inflexa. Longit. mar. 4.5″ crassit. ¼‴. Longit. fem. 1′ 3″; crassit ⅓‴.*

This worm could easily have been the cause of death in this one animal. The blood swarmed with the embryos, and we know that analogous infestations in man cause severe and fatal anæmias in most *filariases*. The disease is transmitted by the bites of insects. We know that *Filaria imitis* of the dog is transmitted by the mosquito common to this climate, *culex pipiens*. It is probable that here, too, a mosquito is the intermediate host between the wild cats.

This animal also presented intestinal and pulmonary worms. The pulmonary worms were identified as *Paragonimus westermanii* by Dr. Allen J. Smith and reported before the Philadelphia Pathological Society, January 25th, 1912. He considered it valuable evidence that the disease is here on the Atlantic seaboard and may be transmitted to man, just as it is transmitted to-day to a goodly percentage of Japanese.

The intestinal worms comprised an unidentified *ascaris*, probably *ascaris mystax*, and three species of tapeworms. One specie has been found to be *Bothriocephalus felis* (Creplin). There were fully a dozen of these worms present. Specimens have been prepared for museum. The *bothriocephalus* of man is the one genus of tapeworm which produces a frank, profound anæmia of pernicious type, and it may be that these worms in such number predisposed to the death of this animal. Along with the *filarial* worms they might easily have done so. The other two species of tapeworms conform to none so far described in any system, and probably represent new species.

The question of most interest is: "Which caused the death of the animals, the enteritis or the worms?" The intensity of the inflammation of the intestines in two cases which I saw left no doubt as to the cause of death in those two cases. The animals were fresh, and no decomposition had set in, yet the mucosa was almost black in patches, so marked were the hemorrhages. These two cases were, in addition, heavily infested with worms which were found in lungs, blood, intestines, stomach and thigh muscles. One of the animals had been in the gardens only eleven days; half a dozen other cases were here from 15 to 30 days. This is too short a period in which a mature worm may develop, and the facts are of importance when one considers that nearly all the cats came almost directly from the wild to the Garden. It is probable that for the last fourteen animals, not over one month, probably less, elapsed between capture and receipt at the Garden. The worms must have been brought in with the animals and it does not seem reasonable that the worms should suddenly in from 15 to 30 days become virulent and so regularly kill the animals. What does seem reasonable is that, even in nature, these worms (especially the *filariæ*) have a depressing influence on the vigor of the animal; that this depressing influence is increased by the new environment with its constant frightenings and, perhaps, new kind or quantity of food; that some infectious agent, maybe relatively innocuous, now entering finds a non-resident host in which it develops. The foregoing expresses the *rationale* of the condition well known amongst physicians as "*status resistentiæ minoris.*"

## OBSERVATIONS ON SPIROPTERA INCERTA IN THE PARROTS.

### Dr. F. D. Weidman.

The appended table shows a high mortality for the past year.

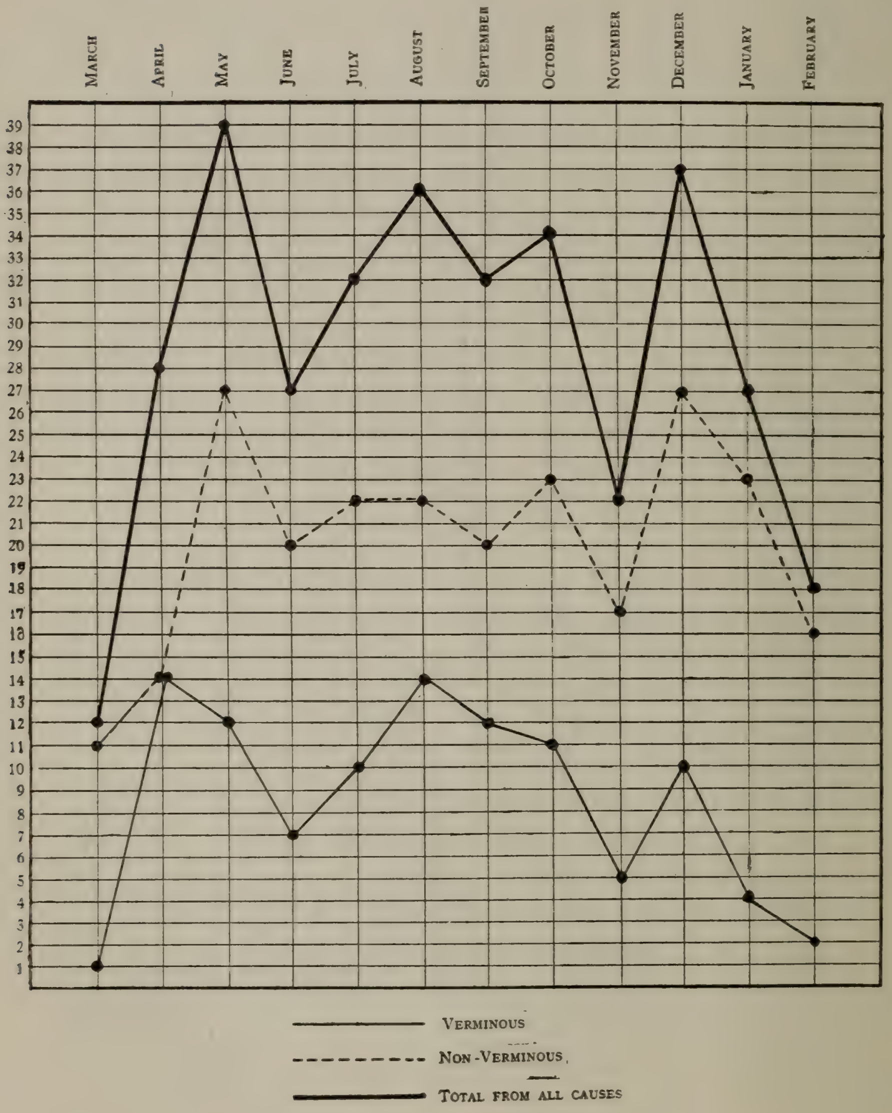
### SUMMARY.

DEATHS AMONG *PSITTACI*.

| YEAR ENDING. | Verminous. | Not verminous. | Total from all causes. | Per cent. dying with worms. | Total number of *psittaci* in collection. |
|---|---|---|---|---|---|
| March 1, 1906....... | 3 | 45 | 48 | 6 | Not obtainable. |
| March 1, 1907....... | 16 | 29 | 45 | 36 | Not obtainable. |
| March 1, 1908....... | 17 | 36 | 53 | 32 | Not obtainable. |
| March 1, 1909....... | 20 | 16 | 36 | 56 | Not obtainable. |
| March 1, 1910....... | 10 | 30 | 40 | 25 | Not obtainable. |
| March 1, 1911....... | 12 | 29 | 41 | 29 | 132. |
| March 1, 1912....... | 24 | 57 | 81 | 30 | 139. |
| Total............. | 102 | 242 | 344 | 30 | |

The proventricular worms noted in years past were collected and investigated. Recalling the frequency of commensalism in lower animals the first point to be determined is whether these worms cause death. The charts herewith would indicate at first sight that the verminous cases appeared only incidentally and did not cause death. Table B shows that the average of verminous birds for seven years has been 30 per cent. In only one year, 1909, has this average been departed from to a marked degree. We can exclude 1906 because the cases were for the first time appearing. A chart which has been prepared would indicate the same, where there is a close correspondence between the verminous and non-verminous curves especially during the past year where we have had a greater number of cases to record.

## Chart Showing Deaths of Psittacii by Months, March 1, 1905, to March 1, 1912.



This chart shows that the highest death rate for Psittaci is to be expected in May, August and December while deaths from proventricular worms show the highest percentages in April, May, July, August, September and October. Generally speaking, spring and late summer show more deaths from worms than other periods.

Against these statistics the clinical picture may be adduced.

Most of the birds infested are parrots, but toucans, pigeons and several other isolated families have been affected. The worm has been described by Dr. Allen J. Smith and named *Spiroptera incerta.** The mature female averages 14 Mm. in length, but a solitary female from a Senegal parrot measured 25 Mm. (1 inch). This female was accompanied by a solitary male. These worms vary in numbers from two to a hundred or more. The largest ones are found either in a ball of mucus occupying the lumen of the proventricle or imbedded in its mucosa. A case was recently posted where the worm was coiled under the serosa, indicating that the worm has considerable powers of penetration. The smallest worms are found under the thick chitinous lining of the gizzard.

Several things would indicate that the worm may cause death and is not always a harmless commensal. The birds are emaciated. In the second place microscopic sections discover marked destruction of the proventricular mucosa, which is the essential gastric structure of birds. In fact it has been named the glandular stomach, in contradiction to the gizzard or muscular stomach. Again there is much swelling and distention of the viscus by mucus, giving the possiblity of obstruction to the ingestion of food. In one case, that of a love bird, the swelling was so extreme as to push the heart over into the right half of the body. In another case an unmistakable perineurial round cell infiltrate in the serosa of the proventricle indicated a chronic neuritis and it may be that this is the mode of death. It would be quite possible for this worm to elaborate substances of a toxic nature (as does the fish tapeworm of man) which would act especially upon the nerves. This fact remains to be established. It is our belief at present that only a part of the cases listed as verminous died as a result of *spiropteriasis;* that the cases showing a few worms and not much tissue destruction died from intercurrent diseases but that others those so greatly emaciated, with occluded lumina, pressure upon the heart and destruction of mucosa undoubtedly died as a result of the presence of the worms.

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* Allen J. Smith: Synopsis of Studies in Metozoan Parasitology—University of Pennsylvania Medical Bulletin, February, 1908.

The work has been prosecuted along three lines, with the following purposes:—

I. To devise a practical method whereby infested birds might be discovered and isolated.

II. To determine the life history of the worm. This is most important from a hygienic and prophylactic standpoint. The facts to be especially determined will be:—

1. Mode of transmission from bird to bird. The value of this is apparent from a prophylactic standpoint.

2. Time elapsing between ingestion of ovum and development of sexually mature female. As long as we have to rely upon finding ova in the droppings we will not be able to detect those birds with *immature* worms. If we can determine the time elapsing between ingestion of egg and maturity of female we will have determined the period of time during which to quarantine *new arrivals,* who, while not showing ova in droppings, may nevertheless harbor immature worms. Again, the determination of this point would give us the intervals at which to re-examine the parrots which have been passed as healthy to the parrot house. In the absence of this knowledge we have run a certain risk. Future re-examina-

tions will have to be made at quite arbitrary intervals until this developmental period is determined. Now that each inmate of the parrot house has been examined and passed any cases developing or dying there with worms will throw new light on the subject.

III. To discover a therapeutic agent.

I. Identification of infested birds.

The external appearances have not been sufficiently characteristic to lead to exact diagnosis. Some birds, even though passing enormous numbers of ova are in good feather. Others show symptoms like any sick bird—feathers ruffled, head hung down, eyes closed. Several cases, however, have shown suggestive symptoms. They extend the neck as though attempting to vomit. A macaw is at present passing a frothy material from the mouth. Another bird which did not have pneumonia, emitted a wheezing sound. Some of the birds produce droppings in larger quantity than their mates, and where these contain mucus, as they often do, we have foretold infestation. But these signs are so inconstant that laboratory diagnosis is necessary. The only avenues to diagnosis would seem to be the blood, urine, stomach contents and temperature. Some time has been spent investigating the blood, but so many technical difficulties arose and so much time was required that this means was abandoned.

Experiments were also performed toward the production of emesis and the recovery of the worms in the vomitus. Preliminary experiments on pigeons were successful. One-tenth grain apomorphine hypodermically caused regurgitation of food. This was probably only from the crop, as no stones accompanied the grain. An amazon received one-fifth grain apomorphine hyperdermically. Excited talking, laughter and some dizziness resulted, but no emesis.

An attempt was then made to draw out the proventricular contents mechanically. This failed, as a small catheter used as a stomach-tube could only be introduced as far as the crop as demonstrated upon a dead parrot.

The urine is evidently useless for diagnosis when we remember the anatomy of the avian excretory apparatus. Temperature determinations would require manipulations which the smaller birds could not stand.

The droppings remain as our sole means of diagnosis. The ova are not easily found. The excreta of birds contain more waste than human dejecta where everything is generally in a finely granular condition. The droppings are laden with such quantities of vegetable cells, colored by chlorophyl that they quite hide the ova unless the latter are in such great numbers as not to be lost by high dilution. Efforts to dissolve this foreign matter have been ineffectual. It was not digested by pancreatin over night in incubator. Boiling with antiformin was inefficient. This latter process, however, broke up the cloudy particles of the droppings, clarified the vegetable cells, dissolved the mucus and urates. Much of the chlorophyl was extracted. Our routine practice is now to boil droppings for five minutes in 10 per cent. KOH, shake one minute, boil three minutes, centrifuge for one-half minute. Two portions of the sediment are examined for ova under the $\frac{2}{3}$ lens, one from the surface and one from the bottom. The preparation of each specimen, examined in lots of ten, requires five minutes. The examination under the lens requires ten minutes where no ova are present. When present they are detected usually in less than one minute, although one case was found only after eight minutes. The total time for examining one bird is thus fifteen minutes. A mechanical stage is used and the entire wet specimen gone over.

With a view to decreasing the amount of debris the birds have been starved for from twelve (in the case of smaller birds) to twenty-four hours (in the case of larger ones), and the droppings collected during the subsequent twelve hours. That this is a necessary procedure has been shown in subsequent examinations of these same birds where they were not starved. In every case the eggs are more concentrated where the bird has been starved. This was shown practically in the case of green-cheeked amazon which was passed as not verminous during our preliminary experiments without starving but detected after starving.

The above method has been employed in all our examinations. We realize that it is not perfect. We know that it is tedious and time consuming. It is proposed to look toward the discovery of a fluid whose specific gravity is intermediate between those of *spiroptera* eggs and digestive debris, in which case one (the eggs) would go to the bottom and the other to the top during centrifugalization. Employing the method outlined above (for convenience called the improved method) every bird in the parrot house has been examined. The birds were removed to a separate building. The parrot house was thoroughly fumigated with formaldehyde. The cages were galvanized and new stands erected. The birds whose droppings showed ova were isolated in the infirmary. The others were sent to the parrot house. Those removed to the infirmary were again examined by improved method without starving, to guard against a possible clerical error by which the specimens might have been mixed.

Results of examinations.

The following birds were sent to the infirmary:—

January 5th, 1912.—Ring-necked Parrakeet No. 2—ova fairly numerous—confirmed January 10th, 1912. St. Thomas Conure—ova great numbers—confirmed January 10th, 1012.

January 24th, 1912.—Swainson's Lorikeet No. 2—ova very numerous—confirmed February 2d, 1912. Blossom-headed Parrakeet No. 3—numerous ova—confirmed February 2d, 1912. Blue-crowned Conure—very few ova—confirmed Januray 31st, 1912.

January 26th, 1912.—Ring-necked Parrakeet—fairly numerous ova—confirmed February 2d, 1912.

January 27th, 1912.—Sulphur-crested Cocatoo—3 eggs in one slide—confirmed February 2d, 1912. Great White-crested Cockatoo—enormous number of ova—confirmed January 31st, 1912. Greater Vasa Parrot—numerous ova—confirmed February 2d, 1912. Mexican Conure—few ova (2 in one slide).

January 31st, 1912.—Illigers Macaw—numerous ova.

February 2d, 1912.—Brown-fronted Macaw—fairly numerous ova—confirmed February 28th, 1912. Golden-naped Amazon—fairly numerous ova—confirmed February 28th, 1912.

February 14th, 1912.—Crested Ground Parrakeet—fairly numerous ova—confirmed February 28th, 1912.

February 16th, 1912.—Green-cheeked Amazon—numerous ova—confirmed February 23d, 1912.

February 21st, 1912.—Blue-fronted Amazon—great numbers of ova—confirmed February 23d, 1912. Roseate Cockatoo—very numerous ova—confirmed February 23d, 1912.

February 23d, 1912.—Blue and Yellow Macaw—very numerous ova—confirmed February 28th, 1912.

March 6th, 1912.—Orange-winged Amazon No. 3—few ova—confirmed March 18th, 1912.

March 8th, 1912.—Crested Ground Parrakeet—few ova.

Prior to the above systematic examination a number of birds had been examined in a desultory manner while marking out a technique. These birds were all re-examined. The birds earlier detected were:—

Examined October 4th.—White-fronted Amazon (2409) confirmed at autopsy.

Examined November 1st.—Golden-naped Amazon.

Examined November 1st.—Unadorned Amazon (2433) confirmed at autopsy.

Examined November 3d.—Orange-winged Amazon No. 3. Blue-fronted Amazon.

Examined December 13th.—Great White-Crested Cockatoo. Roseate Cockatoo No. 3.

Birds dying later—autopsy confirming diagnosis:—

Red Vented Parrot (2424). No *spiroptera.*
Rosehill Parrakeet. No *spiroptera.*

As a result of this systematic examination we have learned:—

*First.*—That we have in the garden 20 verminous birds out of a total of 136 examined—14 per cent.

*Second.*—The worms do not all kill quickly. Orange-winged Amazon was detected November 3d, 1911, three months ago. We must remember, however, that this is the off season for *spiroptera,* as shown by chart No. 2, and we do not now expect many deaths. For this reason it seems unwise at present to make any deductions as to how the expected 20 or 30 deaths next summer will be made up, whether from the 20 birds now isolated, or also from birds at the parrot house whose worms may be now developing.

## 2. Life History of *Spiroptera incerta.*

The work along this line has been disappointing. Ova from proventricular slime of a bird dead with *spiroptera* were placed in various nutrient media (bouillon, condensation water of blood serum media), tap water and weak alkaline and acid solutions. These were kept at various temperatures. One series at room temperature, another at 37.5° and a third at the temperature of a bird's body (41°). They were examined daily. On the sixth day larval worms could be seen issuing from the eggs in tap water at room temperature. They did not hatch in the acid solution, but did appear sporadically in the other solutions at room temperature. The larvæ may be extruded either through the side or the end of the egg. One is at once struck at the size of the worm, and wonders how so large a worm could be coiled in such a small shell. The disappointing factor is the sluggish action of the larva. It is encased in a well marked sheath and while hatching has a languid swaying motion. When hatched its motion is scarcely more than a quiver. By the time it has been hatched an hour all motion has ceased.

Beyond this stage we have seen no development. In 10 to 14 days the worm grows paler, faintly granular and disintegrates.

With the idea that some agent was necessary to dissolve the sheath and liberate the larva weak solutions of HCL and sodium bicarbonate were applied to no avail. At the suggestion of Dr. Fox an emulsion of parrots' proventricular mucosa was made and applied to the embryos. There was no development at room or incubator temperature. The ova in the preceding experiments came from proventricular slime and had not received the action of the bird's intestinal canal. As soon as a bird was found with great numbers of fecal ova they were washed out and the above experiments repeated in graded acids and alkalis, diluted pigeon serum, and tap water at room temperature 41° C. The same results have been achieved hatching best in tap water and serum at room temperature.

Both ova and newly-hatched larvæ have been fed to pigeons on corn and placed in their crops with syringe and catheter. The birds were killed at intervals of one, two and three months and their proventricles and gizzards examined grossly and microscopically (fresh). No infestation. Other pigeons were kept months in cages soiled by parrots known to be verminous; again with no results at autopsy.

Pigeons ought to be susceptible to these worms. Our records show that a barbary turtle dove and white-crowned pigeon died with them in September, 1911, and three blue-crowned pigeons were similarly infested in

September, 1907. In order to get a perfect blood relationship ova and embryos were placed in the crops of newly-arrived parrots which had been tested by the improved method and passed. Another parrot is kept in a cage soiled by a verminous bird. One bird died in four weeks with pneumonia. It showed no worms. The others are examined regularly and so far have shown no ova in the stools.

These failures, along with the sluggish motions of the larvæ, suggest the necessity of an intermediate host. If an intermediate host is necessary it will complicate the determination of the life history. Once discovered, however, it will furnish a point of attack for hygienic and prophylactic measures.

The first host that suggested itself was the cockroach. These along with mice and rats have been obtained from the bird house and examined in past years by Dr. Smith and Dr. Fox with negative results. About twenty of the small German variety were examined by us with similar results. Some were fed with *spiroptera* eggs and examined at intervals. The eggs were found in the intestine but had undergone no changes. The readier hatching in pigeon serum suggests that this is a suitable environment. Experiments are proposed in which eggs and newly-hatched embryos will be placed in abrasions of the proventricle. The mice and larger (Australian) cockroaches are kept in mind and may later on be fed on the eggs and kept in cages with pigeons. The possibility of transference by an insect bite is remote. The blood of birds dead with worms has been repeatedly examined with negative results. The same is true of blood from living verminous birds.

The most rapid hatching occurred in a corked vial of tap water at room temperature, in which a female had been placed to deposit her eggs for subsequent experiments. Four days she was found ruptured, her egg tubes protruding and also ruptured. In them were worms in all stages of hatching, some starting, some partially, some finished.

### 3. Therapeusis.

This phase of the subject has not been prosecuted as vigorously as the preceding phases. The birds have only recently become available for experiment through the systematic examination and most time was demanded in this latter direction and for work on life history.

Theoretically the prospect of a successful therapy is not bright. The worms live in the soft juicy wall of a canal between the crop and gizzard. Sometimes they appear in the lumen of this canal, in which case they are always surrounded by thick, tenacious mucus. If they are pulled out of this with forceps and are laid on the mucus they at once bore into it. It protects them from any passing medicament. This medicament, too, is apt to have only a transient effect while on its way from the crop to gizzard. Those worms which may be partly protruded into the lumen from the wall of the canal can retract and retreat, even as far as the serosa, as shown in one of our museum specimens. The smallest worms are found under the thick, chitinous lining of the gizzard.

It may be necessary, therefore, to use drugs both in the lumen (drugs by mouth) and by way of the blood (hypodermically). So far thymol and arsenic have been used.

Preliminary work on pigeons showed the lethal dose of thymol, suspended in mucilage of acacia to be four grains. Half this dose was given to golden-naped Amazon whose stools showed numerous ova. The drug is squirted into crop through a catheter attached to a syringe, the catheter being passed through a hole in a block of wood which wedges the birds beak apart. In this way we are sure of administering the full dose, and that none enters the trachea. This dose caused no alarming symptoms. Ova could still be found in stool but in reduced numbers. The dose was increased at five-day intervals to six grains. The ova were still present in the stools. With the idea of absorption of the drug into the blood, the thymol has since been suspended in glycerine. The dose of this has been run up to fourteen grains. This is often partially vomited. In such cases no worms or eggs have been found in the vomitus.

In spite of these large doses a few eggs persisted in the droppings. These might have been cast off from dead and decadent worms partly imbedded in the wall of the proventricle. The bird is more sleek at present than before medication.

Thymol was also administered to an unadorned Amazon:—

November 3d, 1911.—1 grain thymol.

November 6th, 1911.—Only two eggs in a smear.

November 11th, 1911.—1½ grains thymol.

November 22d, 1911.—Ova still present.

November 28th, 1911.—Dead from pneumonia. Proventricle contained enormous numbers of living worms.

It would seem from the above that the worms had penetrated deeply into the wall of the organ and escaped the action of the thymol.

More exact work was done with thymol when a bird with great numbers of eggs was found.

Great white-crested cockatoo.

Ova averaged for five days 182,000 per day.

February 14th, 1912.—8 Gr. thymol in glycerine. No worms in droppings February 15th or 16th.

February 16th, 1912.—12 Gr. thymol in glycerine.

February 18th, 1912.—Droppings of two previous days smelled strongly of thymol. Found two large, gravid female worms, dead, translucent on account of the glycerine and not easily detected in the washed and strained droppings. There were doubtless some males passed, but on account of their smaller size and greater delicacy they could not be detected.

February 19th, 1912.—One gravid female, dead.

February 24th, 1912.—No ova whatsoever in droppings of February 20th, 21st, 22d, 23d.

March 6th, 1912.—288,000 eggs passed on March 5th.

March 13th, 1912.—16 Gr. thymol in glycerine.

In order to attack them through the blood arsenic was employed. A pigeon received one dram of Fowler's solution by mouth with no embarrassment. The golden-naped Amazon above mentioned which had received thymol received two such doses, one on February 7th, again on February 21st. On February 28th could find but one egg per smear by improved method.

Thinking that arsenic might not be well absorbed by the bird's digestive tract, five minims of Fowler's solution was given hypodermically to a pigeon. In twenty minutes it was dead. This method, therefore, seems impracticable. Atoxyl was tolerated much better. Ten minims hypodermically caused vomiting and diarrhœa. Fifteen minims caused death over night.

The next step will be to administer the atoxyl and thymol simultaneously. Salvarsan is kept in mind.

Summary: Aside from negative findings the experiments have disclosed:—

*First.*—A fairly certain method of identifying verminous birds, resulting in their isolation.

*Second.*—That the ova hatch in 4 to 6 days, best in tap water at room temperature.

*Third.*—That thymol reduces the number of ova in the dejecta.

## OSTEOMALACIA.

Under this term is included all the softenings of bone. It is not an easy matter in all cases to differentiate sharply between a true rachitis or insufficient bone deposite, and an overactive bone destruction. One of the last cases of this sort concerned a Weeper Cebus, young but probably of almost completed development. The long bones, including the ribs, were of almost completed development, while the epipyseal joints were irregular and the marrow hyperemic. This particular monkey had been here for some time and had always appeared to thrive.

We have had four osteomalacia cases in 1911 and 1910, three in 1909, four in 1908. While these numbers run along very evenly, there is a reduction of cases among the primates. Formerly the numbers were made up chiefly from the Ateles and Cebus monkeys; in the past two years more raccoons and birds were affected. For this report we include a raccoon, a gazelle, a night monkey, a baby yellow baboon (true rachitis) and the Weeper Cebus described above. There is also a noteworthy difference in the degree of deformity in the past two years. When the larger animals are affected, they live long enough to sink into curious attitudes producing very marked shortening and deepening of the thorax.

I have tried, separately and combined, calcium lactophosphate and adrenal extract. One pair of Anubis Baboons were noted upon arrival to have slightly curved tibiæ. They were started immediately upon treatment and continued for six months. One died very shortly after stopping the medicine, the other living about one year with ever-increasing deformity. These animals were by no means fully developed, yet their pathological condition was one of excessive bone absorption. In only one of our cases has there been any perceptible disease of the adrenal or ovary.

I gather the impression, only from the youth of many specimens and from the early involvement of long bones, that we are dealing with some condition preventing proper calcification and at the same time disturbing the regulation of normal bone absorption. The laboratory records do not throw any light upon the effect of length of captivity, age, sex or breeding.

Since March 1st, 1906, the records of osteomalacia show the following:—

Ateles Monkeys, 6.
Capucin Monkeys, 4.
Yellow Baboons, 1.
Night Monkeys, 2.
Birds, 5.
Raccoons, 4.
Gazelle, 1.

## TUMORS.

The occurrence of neoplasms in wild animals is a very interesting question to us, and this interest is increased by the fact that we have observed more tumors here than can be found in all other records added together. I have collected our observations in a paper form and this will shortly be published. It shows that tumors occurred in 34 or 1.34 per cent. of 2533 autopsies in the ten years of this laboratory's existence. The orders chiefly affected were *carnivora, ungulata* and *psittaci,* while *primates, lemures* and *anseres* failed to show any tumors. Our statistics do not, however, permit any conclusions as to the effect of age, sex or length of stay in the garden. The epithelial tumors are more common among the animals bred in the wild, while sarcomata are commonest among the captive born. The tumors among the animals posted this year are as follows:—

2249. Undulated Grass Parrakeet (*Melopsittacus undulatus*):
Papillary adenoma of kidney.

2333. Woodchuck (*Arctomys monax*):
Adenoma simplex of liver.

2408. Gray Squirrel (*Sciurus carolinensis pennsylvanicus*):
Hypernephroma of kidney.

2478. Undulated Grass Parrakeet (*Melopsittacus undulatus*):
Adenocarcinoma of oviduct.

2481. Red-shouldered Buzzard (*Buteo lineatus*):
Mixed cell sarcoma of lumbar muscles (retroperitoneal).

2515. Isabelline Gazelle (*Gazelle isabella*):
Osteofibroma of superior maxilla.

2515. Clouded Leopard (*Felis nebulosa*):
Epithelioma of pleura.

2535. California Hair Seal (*Zalophus californianus*):
Hypernephroma of adrenal.

## VEGETATIVE ENDOCARDITIS.

Last year we noted in the report that six cases of endocarditis had been observed. Four of these were among opossums and now to this number we can add three. These animals all came from the same cage, but were not all of the same lot, being successive acquisitions. The appearance of seven cases of this disease in the same species of animals is interesting and instructive. The causative organism in three cases was a pure culture of *streptococcus*. In another this was combined with a capsulated fermenting bacterium very infrequent in such vegetations but common enough in the intestine. It was therefore probably a post mortem invader. The cases varied but little so far as the heart was concerned. The left side was involved in all. The vegetations varied from an acute soft fragile exudation to a large firm cauliflower mass. One case showed cicatricial contraction with very small vegetations. The first was apparently the origin of dissemination of the poison throughout the body, for evidences of septicemia of varying grades were frequently present. Petechial hemorrhages and thromboses were common. In one of these acute cases an arthritis was found, not a very uncommon thing in *streptococcus* septicemia. Then we have the type of firm cauliflower-like vegetation assocaited with less violent signs of acute disease. These are simply longer developments of the first type. The general pathology shows a prolonged poisoning with subacute or even chronic inflammations in the kidneys and liver. Compensation is seldom lost, although this is difficult to explain when we consider that usually after death the aortic valve aperture will scarcely permit the passage of a hair. The mitral has also been nearly tight. Nevertheless no noteworthy hypertrophy of chamber walls has occurred. A few animals showed a mild passive congestion of lungs and liver, so that blood pressure changes are not completely adjusted. The heart muscle has shown no unusual degeneration. There has been no one infection atrium by which our attention was arrested. The lungs have shown very few inflammatory changes.

This epidemic of endocarditis can only be explained by conceiving that the animals passed the bacteria almost directly from one to the other since the *streptococcus* live but a very short time in nature. Biologically there is nothing specific for endocarditis in the bacteria isolated. One experiment to produce this disease in a rabbit by injecting a culture isolated from an opossum had a negative result.

Respectfully submitted,

HERBERT FOX, M.D.,
*Pathologist.*

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Date Due

BOUND MAY 1973